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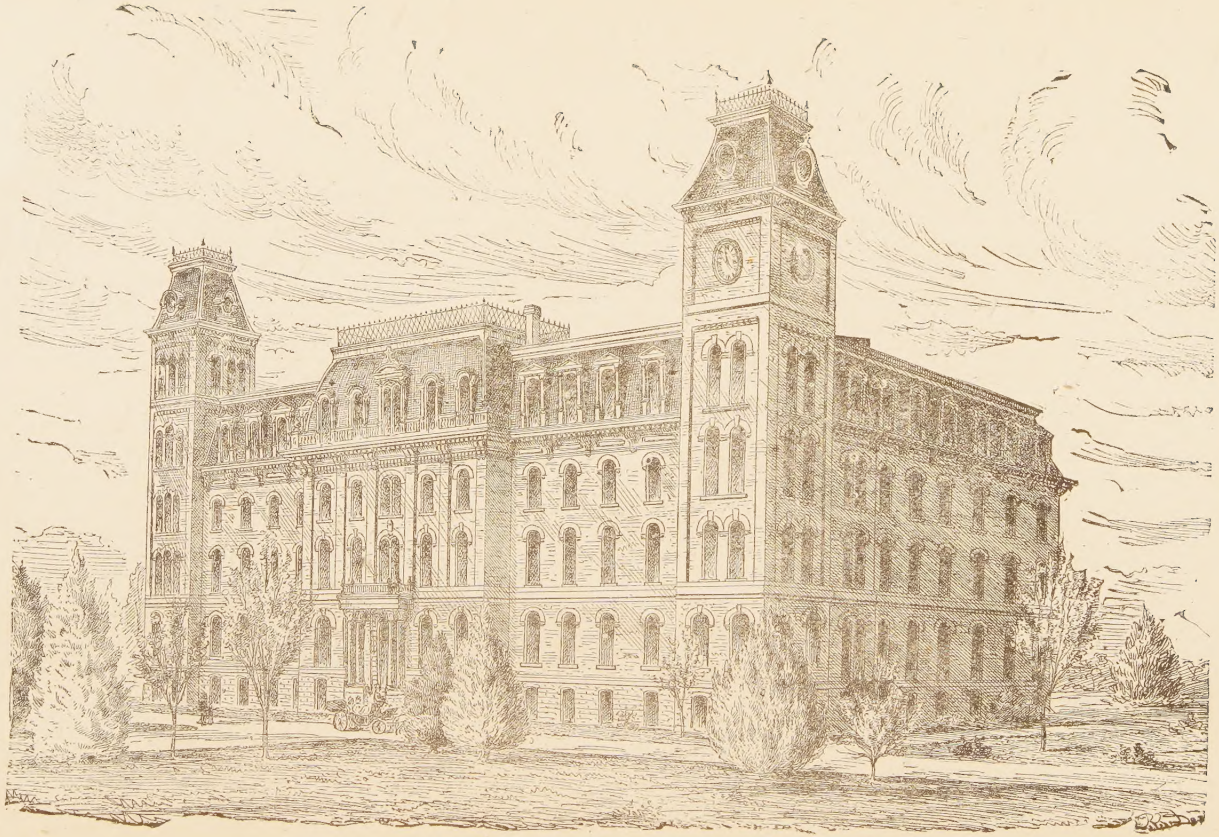


MAIN BUILDING.

TWELFTH REPORT

(Seven annual, five biennial.)

OF THE

BOARD OF TRUSTEES

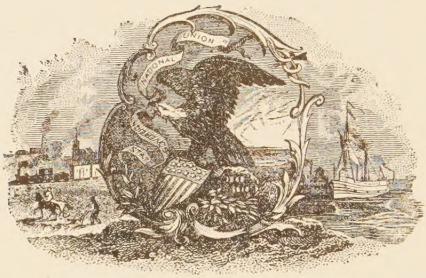
OF THE

ILLINOIS INDUSTRIAL UNIVERSITY.

URBANA, CHAMPAIGN COUNTY, ILLINOIS.

For the Two Years ending September 30, 1884.

SPRINGFIELD, ILL.:
H. W. ROKKER, STATE PRINTER AND BINDER
1885.


UNION
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ILLINOIS INDUSTRIAL UNIVERSITY,
URBANA, ILL., October 15, 1884.

To his Excellency, JOHN M. HAMILTON, *Governor of Illinois:*

I have the honor to submit herewith the Twelfth Report of the Board of Trustees of the Illinois Industrial University, for the two years ending September 30, 1884, including an account of the organization and equipment of the University, the minutes of the Board meetings, and special papers of practical and scientific interest by members of the Faculty.

Very respectfully and obediently, yours,

T. J. BURRILL,
Corresponding Secretary.

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BOARD OF TRUSTEES.

UNDER LAW OF MAY 7, 1873.

EX OFFICIO.

JOHN M. HAMILTON, *Governor of the State of Illinois.*
JOHN LANDRIGAN, *President State Board of Agriculture.*

TERM EXPIRES 1885.

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S. M. MILLARD, Highland Park.
PARKER EARLE, Cobden.

TERM EXPIRES 1887.

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JOHN T. PEARMAN, M. D., Champaign.
ROBERT N. PADEN, Litchfield.

TERM EXPIRES 1889.

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ALEXANDER McLEAN, Macomb.
PHILIP H. POSTEL, Mascoutah.

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Prof. E. SNYDER, Recording Secretary.
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JOHN T. PEARMAN.
CHARLES BENNETT.

JAMES D. CRAWFORD, Librarian.

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Professor of Geology and Zoölogy.

CHARLES McCLURE,
Second Lieutenant, Eighteenth Infantry, U. S. A.,
Professor of Military Science and Tactics.

---

*For 1882-4.

*STEPHEN A. FORBES, PH. D.,
Professor of Zoölogy and Entomology.

JEROME SONDERICKER, C. E.,
Assistant Professor of Engineering and Mathematics.

CHARLES W. ROLFE, M. S.,
Assistant Professor of Natural History.

ARTHUR T. WOODS,
Assistant Engineer, U. S. N.
Assistant Professor of Mechanical Engineering.

EDWIN A. KIMBALL,
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GEORGE W. PARKER,
Instructor in Wood-work, and Foreman.

EMMA M. HALL, M. A.,
Instructor in Ancient Languages.

MARY E. DARROW, B. A.,
Instructor in Modern Languages.

†MRS. ABBIE WILKINSON,
Teacher of Vocal and Instrumental Music

MISS KITTIE BAKER,
Teacher of Vocal and Instrumental Music.

WILLIAM A. WETZEL,
Teacher of Elocution.

ARTHUR W. PALMER, B. S.,
First Assistant in Chemical Laboratory.

FRED W. EBERLEIN,
Second Assistant in Chemical Laboratory.

A. B. BAKER,
Janitor.

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*Appointed June, 1884.
†For 1882-4.

SUMMARY OF STUDENTS

For the year ending June, 1883.

By Classes.	Gentlemen	Ladies	Total.
Resident graduates	4	1	5
Seniors	28	13	41
Juniors	52	17	69
Sophomores	53	18	71
Freshmen	64	18	82
Preparatory	80	20	100
Special	8	6	14
Total	289	93	382
By Courses.			
Agriculture	28		28
Mechanical engineering	39		39
Civil engineering	52		52
Mining engineering	3		3
Architecture	18		18
Chemistry	40		40
Natural history	7	4	11
Art and design		7	7
English and modern languages	48	69	117
Ancient languages	13	2	15
Elective	14	4	18
Not specified	23	6	29
	285	92	377
Resident graduates	4	1	5
Total	289	93	382

SUMMARY OF STUDENTS

For the year ending June, 1884.

By Classes.	Gentlemen	Ladies	Total.
Resident graduates	3		3
Seniors	39	13	52
Juniors	31	13	44
Sophomores	50	12	62
Freshmen	55	16	71
Preparatory	76	9	85
Special	7	6	13
Total	261	69	330
By Courses.			
Agriculture	24		24
Mechanical engineering	45		45
Civil engineering	51		51
Mining engineering	2		2
Architecture	21		21
Chemistry	26		26
Natural history	12	5	17
Art and design		6	6
English and modern languages	41	53	94
Ancient languages	7	1	8
Elective	8	4	12
Not specified	21		21
	258	69	327
Resident graduates	3		3
Total	261	69	330

THE UNIVERSITY.

HISTORY.

The Illinois Industrial University, the State University of Illinois, had its origin in a movement for the higher education of the industrial classes, begun in 1851, and resulting in the congressional grant of lands for this purpose, made to the several States in 1862, and amounting in this State to 480,000 acres. The University was chartered in February, 1867, and opened to students in March, 1868. In addition to the endowment from the land grant, over $400,000 were donated by Champaign county in bonds, buildings and farms. The State also has made large appropriations for fitting up and stocking the farms, for library and apparatus, and for buildings, including the large main building erected in 1872 and 1873, the Mechanical Building and Drill-hall, and the Chemical Laboratory. Successive colleges and schools have been added as required, until four colleges, including ten district schools, have been organized.

The whole number matriculated as students since the opening is 1,831. The number graduated from the several colleges, including the class of 1883, is 369. In 1871 the University was opened for lady students, on the same terms as to gentlemen. In 1874 a Fine Art Gallery was established. In 1876 the University received from the Centennial Exposition at Philadelphia, three diplomas and a medal. In 1877 its exhibit at the Paris International Exposition gained a diploma and the gold medal.

LOCATION.

The University has a beautiful and healthful situation on the high grounds between the cities of Champaign and Urbana, and within the corporate limits of the latter. It is one hundred and twenty-eight miles south from Chicago, at the junction of the Illinois Central, the Indiana, Bloomington and Western, and the Wabash railways. The county is a region of beautiful rolling prairies, with large belts of timber along the streams, and is one of the richest farming districts in the State.

BUILDINGS AND GROUNDS.

The domain occupied by the University and its several departments embraces about 623 acres, including stock farm, experimental farm, orchards, gardens, nurseries, forest plantations, arboretum, ornamental grounds, and military parade ground.

The University buildings, fifteen in number, include a grand main building for public use, one large and two small Dormitory buildings, a spacious Mechanical building and Drill-hall, a large Chemical laboratory, a Veterinary hall, a small Astronomical observatory, three dwelling, two large barns, and an ample green-house.

The Mechanical building and Drill-hall is of brick, 126 feet in length and 88 feet in width. It contains a boiler, forge and tank-room; a machine shop, furnished for practical use, with a steam engine, lathes, and other machinery; a pattern and finishing shop; shops for carpentry and cabinet work, furnished with wood-working machinery; paint room and rooms for models, storage, etc. In the second story is the large Drill-hall, 124 by 80 feet, sufficient for the evolutions of a company of infantry, or a section of a battery of field artillery. It is also well supplied with gymnastic apparatus. One of the towers contains an armorer's shop and military model room, an artillery room and a band room. The other contains a printing office and editor's room.

The large Dormitory building is 125 feet in length and five stories in height. This was so badly damaged by storms in the spring of 1880 that it is not fit for use. It afforded 80 private rooms for students. Two smaller Dormitory buildings contain eight rooms each. The new Chemical building, erected in 1878 at a cost, including furniture, of $40,000, contains five laboratories, and is one of the best and largest in the United States.

ADMISSION AND GRADUATION.

CHOICE OF STUDIES.

It has been a favorite aim of the University from the outset, to allow as much freedom as possible in the selection of studies.

A University is designed not for children, but for men and women, who may claim to know something of their wants, powers and tastes. It is not useful to require every student, without regard to his capacity or practical wants, to take entire some lengthened "course of study." Each student should weigh carefully his own powers and needs, and counsel freely with his teachers as to the branches he may need to fit him for his chosen career, and then should pursue them with earnestness and perseverance, without faltering or fickleness.

It is necessarily required:—that the student should be thoroughly prepared to enter and keep pace with the classes in the chosen studies, and that he shall take these studies in the terms in which they are taught. Candidates for a degree must take the course of study prescribed for that degree.

Each student is expected to have three distinct studies, affording three class exercises each day. On special request, the Faculty may allow less or more.

No change in studies can be made after the beginning of a term, without permission of the Faculty.

Due care will be taken to prevent, as far as possible, all abuse of the liberty of choice. Students failing to pass satisfactory examinations in their chosen studies, will not be permitted to remain and take other studies without a vote of the Faculty.

REQUIRED STUDIES.

To secure the diffusion of the sciences relating to the great industries, the State Legislature, in 1873, prescribed that each student should be taught some of those sciences.

The Trustees accordingly require that each student shall take, each term, one study at least from the following list:

Physics, Chemistry, Mineralogy, Physical Geography, Anatomy and Physiology, Botany, Zoölogy, Geology, Entomology; Drawing and Designing, Mathematics, Surveying; Elements of Agriculture and Horticulture, Vegetable Physiology, Agricultural Chemistry, Agricultural Engineering and Architecture, Animal Husbandry, Rural Economy, Landscape Gardening, History of Agriculture, Veterinary Science; Architectural Drawing and Designing, Elements of Construction, Graphical Statistics, History and Esthetics of Architecture, Estimates, Mining Engineering, Metallurgy, Analytical Mechanics, Geodesy, Principles of Mechanism, Hydraulics, Thermo-dynamics, Strength of Materials, Prime Movers, Mill Work, Machine Drawing, Roads and Railroads, Construction and use of Machinery, Modeling and Patterns, Bridges, Stone Work, Astronomy; Military Science, and Political Economy.

EXAMINATIONS FOR ADMISSION.

Examinations of candidates for admission to the University, or any of its departments, are held at the University itself, the day previous to the opening of each term. These examinations embrace the following studies:

1. English Grammar, Arithmetic, Geography, and History of the United States, for all the colleges. These examinations are as thorough as those required for second-grade certificates for teachers in the public schools.

2. Algebra, including equations of second degree and the calculus of radical quantities; Geometry, plane and solid. These are required also for all the colleges.

3. Physiology, Botany, Natural Philosophy, English Rhetoric and Composition. These are required in addition to 1 and 2 for candidates for the Colleges of Agriculture, Engineering and Natural Science.

4. Physiology, Botany, Natural Philosophy, Latin Grammar and Reader, Cæsar, Cicero, Virgil, and Latin Prose Composition, in addition to 1 and 2, for School of English and Modern Languages.

5. Latin (as in 4), Greek Grammar and Reader, four books of Xenophon's Anabasis, and Greek Prose Composition, in addition to 1 and 2, for candidates for School of Ancient Languages.

For further information concerning terms of admission, see *"Admission"* under the several colleges; also *"Preliminary Year."*

COUNTY SUPERINTENDENT'S CERTIFICATES.

To prevent loss to those who are not prepared to enter the University, but might come, hoping to pass the examinations for admission, the following arrangement has been made:

County Superintendents of Schools will be furnished with questions and instructions for the examination of candidates in the four common branches, Arithmetic, Geography, English Grammar, and History of the United States; those who pass creditably will, when they present the Superintendent's certificate to that effect, be admitted to the classes of the Preliminary year.

ACCREDITED HIGH SCHOOLS.

The Faculty, after personal examination, appoint accredited High Schools, whose graduates may be admitted to the University without further examination. These must be schools of first rate character, whose courses of instruction include all the studies required for admission to some one of the colleges of the University. On application, a member of the Faculty is sent to examine the school making application, as to its facilities for teaching, its course and methods of instruction, and the general proficiency shown. If the report is favorable, the name of the school is entered in the published list of High Schools, accredited by the University. The graduates of these schools are admitted to any of the colleges for which their studies may have prepared them. The appointment continues as long as the work of the school is found satisfactory. Annual reports are asked from these schools.

List of Accredited High Schools.

Princeton High School	Chas. Raymond,	Principal.
Lake View High School	A. F. Nightingale,	"
Champaign, West High School	M. Moore,	"
Decatur High School	J. N. Wilkinson,	"
Urbana High School	J. W Hays,	"
Oak Park High School	B. L. Dodge,	"
Chicago S. Division High School	Jeremiah Slocum,	"
Chicago N. Division High School	O. S. Westcott,	"
Chicago W. Division High School	Chas. P. Welles,	"
Hyde Park High School	Lesli Lewis,	Superintendent.
Marengo High School	C. J. Allen,	Principal.
Kankakee High School	F. M. Tracey,	"
Mattoon E. Side High School	I. L. Becker,	"
Springfield High School	F. R. Feitshans,	Superintendent.
Monticello High School	G. A. Burgess,	Principal.
Warren High School	D. E. Graver,	"
Peru High School	Joseph Carter,	"
Peoria High School	Geo. E. Knoppler,	"
Galena High School	R. L. Barton,	"
Shelbyville High School	J. F. Goudy	"
Sycamore High School	A. J. Blanchard,	"
Rochelle High School	P. R. Walker,	"
Rossville High School	W. A. Chamberlin,	"
Bement High School	W. E. Mann,	"
Oakland High School	Charles I. Parker,	"

Jacksonville High School	D. H. Harris,	Superintendent.
Danville High School	S. Y. Gillan,	Principal.
Charleston High School	E. J. Hoenshel,	"
Tuscola High School	F. A. E. Starr,	"
Streator High School	N. Williams,	"
Ottawa High School		
Bloomington High School	G. F. Draper,	"
Aurora E. Side High School	N. A. Prentiss,	"

PREPARATORY WORK.

To meet an urgent demand, the Trustees consented to provide for teaching the preparatory studies lying between the work of the common school and that of the University.

Candidates for these classes should not be less than fifteen years old. They must pass satisfactory examinations in Arithmetic, Geography, English Grammar, and History of the United States. The examination in these branches should be equal to that usually required for a second-grade certificate for teachers. This examination may be made by county superintendents. The studies taught in the preliminary year are as follows:

PREPARATORY STUDIES.

For the Colleges of Engineering, Agriculture, and Natural Science. *First Term.—Algebra*—(Olney's Fundamental Rules, Factoring, Common Divisors and Multiples, Powers and Roots, Calculus of Radicals, Simple Equations, Proportion and Progression.) *Physiology*—(Dalton's or an equivalent.) *Natural Philosophy*—(Norton's or an equivalent.)

Second Term.—Algebra—Quadratic Equations, etc. *Geometry*—Plane Geometry, Lines, Circumferences, Angles, Polygons, as far as Equality in Olney's Geometry. *English*—Elements of Composition. (Gilmore's Art of Expression or equivalent.) Orthœpy and Word Analysis. (Introduction to Webster's Academic Dictionary.)

Third Term.—Geometry completed, including Solid Geometry and the Sphere. *English* as in the second term, with addition of Goldsmith's Traveler, or an equivalent, read for analysis. *Botany*—Gray's Lessons in Botany, or an equivalent.

FOR COLLEGE OF LITERATURE AND SCIENCE.

First Term.—Algebra, as above. *Latin*, Cæsar. *Greek*, Grammar and Reader.

Second Term.—Algebra and *Geometry*, as above given. *Latin*, Cicero's Orations. *Greek*, Xenophon's Anabasis.

Third Term.—Geometry, completed. *Latin*, Virgil's Æneid. *Greek*, the Anabasis.

N. B.—Greek is required only for the School of Ancient Languages. The School of English and Modern Languages requires Physiology, Natural Philosophy, and Botany, instead of Greek.

Students in the preparatory studies are not matriculated as University students. They pay no entrance fee, but are charged a tuition fee of five dollars a term, and the incidental fee of seven and a half dollars a term. They have all the privileges of the library and of the public lectures.

N. B.—No student is matriculated as a college student until all preparatory studies are completed.

DEGREES AND CERTIFICATES.

The law provides that, "on recommendation of the Faculty, the Trustees may authorize the Regent, as president of the University, to issue diplomas to such persons as shall have completed satisfactorily the required studies and sustained the examination therein, conferring such literary and scientific degrees as are usually conferred by universities for similar or equivalent courses of studies, or such as the Trustees may deem appropriate." (Approved May 11, 1877.)

In accordance with the law, the following system of degrees has been adopted for the University:

1. All studies will remain as heretofore, free. Each student may choose and pursue such studies as he may desire, subject only to such conditions as to preparation, times of study, and number of studies, as may be necessary to secure efficiency in classes and economy in teaching.

2. But students who wish to be candidates for any degree must complete fully the course of studies prescribed for such degree.

3. Students not candidates for any degree will be enrolled as special students, and will receive at the close of their attendance, if not less than a year, the certificates provided by law, with statements of work done and credits attained.

4. It is designed that the requirements for all the Bachelor degrees shall be, as nearly as possible, equal in amount and value.

5. The degree of Bachelor of Science, B. S., will be given to those who complete either of the courses of studies in the colleges of Engineering, Agriculture, or Natural Science. The name of the school will be inserted after the degree.

6. The degree of Bachelor of Letters, B. L., will be given to those who complete the course in the school of English and Modern Languages.

7. The degree of Bachelor of Arts, B. A., will be given to those who complete the course of the school of Ancient Languages.

8. The Master degrees, M. S., M. L., and M. A., and the equivalent degrees of C. E., M. E., etc., will be given only to those who have pursued, and passed examinations on a year of prescribed post-graduate studies, or after a term of successful practice. In either case an accepted thesis will be required.

EXPENSES.

The tuition is free in all the University classes.

The matriculation fee entitles the student to membership in the University until he completes his studies, and must be paid before he enters. Amount $10 00

The term fee for incidental expenses is, for each student... 7 50

Room rent in University dormitory, each student per term, $2 to 6 00

Each student in the Chemical and Physical laboratories, and in the Draughting and Engineering classes, is required to make a deposit varying from 50 cents to $8, to pay for chemicals and apparatus used, and for any breakages or damages.

All bills due the University *must be paid before the student can enter* classes.

The following are the estimated maximum and minimum annual expenses, exclusive of books and clothing, of a residence of thirty-six weeks at the University:

Characterization of Expenses.	Minimum.	Maximum.
Term fees and room rent for each student	$28 50	$34 50
Table board in boarding houses and clubs	72 00	144 00
Fuel and light	10 00	15 00
Washing, at 75 cents per dozen	13 50	27 00
Total annual amount	$124 00	$220 50
Board and room in private houses, per week	$4 00	$6 00

Fees in the Preliminary Year.

Tuition, per term	$5 00
Incidental fee, per term	7 50

Special Fees.

For music, for 20 lessons	$10 00
For painting or drawing, to special students	10 00
Graduating fee	5 00

The Organization and Equipment of the University, With Some Account of Its Work.

COLLEGES AND SCHOOLS.

The institution is a University in the best American sense, though differing designedly in the character of some of its Colleges from the older institutions of this country. It embraces four Colleges, which are sub-divided into Schools. A school is understood to embrace the course of instruction needful for some one profession or vocation. Schools that are cognate in character and studies, are grouped in the same College. The following are the Colleges and Schools:

I. College of Agriculture.

School of Agriculture.

II. College of Engineering.

School of Mechanical Engineering. School of Architecture.

School of Civil and Mining Engineering.

III. College of Natural Science.

School of Chemistry. School of Natural History.

IV. College of Literature and Science

School of English and Modern Languages.

School of Ancient Languages.

V. Additional Schools.

School of Military Science. School of Art and Design.

Vocal and Instrumental Music, Elocution and Photography are also taught, but not as parts of the regular courses.

COLLEGE OF AGRICULTURE.

SPECIAL FACULTY.

The Regent,	Professor Prentice,
Professor Morrow, Dean,	Professor McMurtrie,
Professor Burrill,	Professor Jillson.

OBJECT OF THE COLLEGE.

The aim of this college is to educate scientific agriculturists and horticulturists. The frequency with which this aim is misunderstood, demands that it shall be fully explained. Many, who look upon agriculture as consisting merely in the manual work of plowing, planting, cultivating, and harvesting, and in the care of stock, justly ridicule the idea of teaching these arts in a college. The practical farmer who has spent his life in farm labors, laughs at the notion of sending his son to learn these from a set of scientific professors. But all this implies a gross misunderstanding of the real object of agricultural science. It is not simply to teach *how* to plow, but the reason for plowing at all—to teach the composition and nature of soils, the philosophy of plowing, of manures, and the adaptation of the different soils to different crops and cultures. It is not simply to teach *how* to feed, but to show the composition, action, and value of the several kinds of food, and the laws of feeding, fattening, and healthful growth. In short, it is the aim of the true Agricultural College to enable the student to understand thoroughly all that man can know about soils and seeds, plants and animals, and the influences of light, heat, and moisture on his fields, his crops, and his stock; so that he may both understand the reason of the processes he uses, and may intelligently work for the improvement of those processes. Not "book farming," but a knowledge of the real nature of all true farming—of the great natural laws of the farm and its phenomena—this is the true aim of agricultural education. Agriculture involves a larger number of sciences than any other human employment, and becomes a fit sequence to any collegiate training.

The steady aim of the Trustees has been to give the College of Agriculture the largest development practicable, and to meet the full demand for agricultural education, as fast as it shall arise. Agricultural students are especially invited to the University.

Boards of Agriculture, Agricultural and Horticultural Associations, State and county, are invited to cooperate with the University in its efforts to awaken a more general appreciation of the value of education, and to add, by the establishment of scholarships, or other means, to the number of those who avail themselves of its facilities for instruction.

APPARATUS AND EQUIPMENTS.

The College has, for the illustration of practical agriculture, a stock farm of 110 acres, provided with a large stock barn fitted up with stables, pens, yards, etc., and an experimental farm of 180 acres, furnished with all necessary apparatus. It has fine specimens of neat cattle, Short-horns and Jerseys, with several breeds of swine, to illustrate the problems of breeding and feeding. The Experimental Department exhibits field experiments in the testing of the different varieties and modes of culture of field crops, and in the comparison and treatment of soils. It includes experiments in Agriculture and Horticulture, under the direction of the Professors of Agriculture and of Horticulture, and experiments in feeding animals of different ages and development, upon the various kinds of food. In common with similar departments in the several Agricultural Colleges of the country, it attempts to accumulate knowledge preparatory to the development of an agricultural science.

The barn on the stock farm has north and west fronts of 80 feet each. Each limb, or L, is 40 feet wide. It is of the kind known as the side-hill barn. The barn on the experimental farm is of less size, but is fitted up with great convenience, and is supplied with a mill for grinding feed, run by a large wind-mill.

A Veterinary hall and stable has been provided, and a clinic is held to illustrate the lectures on veterinary science. The Department has Dr. Auzoux' celebrated complete model of the horse, in 97 pieces, exhibiting 3 000 details of structure; also *papier-mache* models of the foot and teeth of the horse at different ages.

Surveying and Drainage are illustrated by field practice with instruments, and by models. Agricultural Chemistry is taught by lectures and laboratory practice, in the analysis of soils, fertilizers, foods, etc.

Upon the grounds devoted to the use of the College, there are: 1. An apple orchard planted in 1869, containing about 1.0 0 varieties, with pears, cherries, grapes and small fruits. 2. A nursery of young trees, in which students have regular work in grafting, etc. 3. A forest-tree plantation of the most useful kinds of timber. 4. An arboretum, in which hardy indigenous and exotic trees are planted as fast as they can be secured; it now contains nearly 100 species. The ornamental grounds which surround the University building occupy about twenty acres, kept in neat and attractive style. These, with the adjuncts of trees and flowering shrubs, lawn and beds of flowers and foliage plants, walks of different material and styles of laying out, illustrate the class-room work in landscape gardening. A green-house contains a collection of plants of great value to the classes in floriculture and landscape gardening, and furnishes practice in hot-house and green-house management.

Among the more notable may be mentioned a variety of palms, specimens of coffee, tea, banana, sugar cane, custard apple, orange, rubber tree, maranta, fig, aloe, pine-apple, pepper, New Zealand flax, camphor, cinchona, eucalyptus, tamarind, cactus, acacia orchis.

Aside from the general library, museums and cabinets, the College has collections of soils, seeds, models of implements, photographs and engravings, a series of colored plaster casts of fruits prepared

at the University; *models clastiques* of fruits and flowers from Paris; collections of specimens of woods, of beneficial and injurious insects; numerous dry and alcoholic specimens, etc. The herbarium is rich in specimens of useful and noxious plants, including many of the fungous parasites destructive to cultivated plants.

INSTRUCTION.

The full course occupies four years, and includes special agricultural, horticultural and veterinary studies. The first are designated: Elements of Agriculture, Agricultural Engineering and Architecture, Animal Husbandry, Rural Economy and General Farm Management, and History of Agriculture. The special horticultural studies are: Elements of Horticulture, Pomology and Forestry, Floriculture, Plant Houses and their Management, and Landscape Gardening. The veterinary studies are: Anatomy and Physiology of Domestic Animals, Veterinary Medicines, Principles and Practice of Veterinary Science, Veterinary Sanitary Science, etc. During the Spring term there is a clinic at the infirmary, where numerous cases of diseased animals are presented and treated before the class free of charge to the owners. Instruction is usually given by lectures and illustrations from the College grounds and collections. The diversified farm crops, the living animals and plants, the collection of machinery, the buildings and appointments, are all useful in making instruction practical and possible. For those whose time is limited, a one year's course of technical study is provided. Special horticultural studies may also be chosen for one year's work.

The instruction unites, as far as possible, theory and practice—theory explaining practice, and practice illustrating theory. The technical studies are taught mainly by lectures, with careful readings of standard agricultural books and periodicals, and frequent discussions, oral and written, by the students, of the principles taught. These are also illustrated by demonstrations and observations in the fields, stables, orchards, gardens, plant-houses, etc.

AGRICULTURAL COURSE.

Required for the Degree of B. S., in College of Agriculture.

FIRST YEAR.

1. Elements of Agriculture; Chemistry; Trignometry; Shop Practice (optional).
2. Elements of Horticulture; Chemistry; British Authors, or Free Hand Drawing.
3. Vegetable Physiology; Chemistry; Rhetoric.

SECOND YEAR.

1. Agricultural Chemistry (Soils and Plants); Botany; German.
2. Agricultural Chemistry (Tillage, Fertilizers, Foods); Botany; German.
3. Economic Entomology; Zoölogy; German.

THIRD YEAR.

1. Agricultural Engineering and Architecture; Animal Anatomy and Physiology; Geology or Ancient History.
2. Animal Husbandry; Veterinary Science; Physics or Mediæval History.
3. Landscape Gardening; Veterinary Science; Physics or Modern History.

FOURTH YEAR.

1. Meteorology and Physical Geography; Mental Science; History of Civilization.
2. Rural Economy; Constitutional History; Logic.
3. History of Agriculture and Rural Law; Political Economy; Laboratory Work.

ONE-YEAR COURSE.

Students will be admitted to this course on passing a satisfactory examination in the common school branches, but they will receive greater benefit from it if they have made better preparation, especially if they have a good knowledge of Botany and Chemistry. They should not be less than eighteen years of age.

The studies are taught in the following order:

1. Elements of Agriculture; Agricultural Engineering and Architecture; Animal Anatomy and Physiology; Shop Practice.
2. Animal Husbandry; Rural Economy; Veterinary Science.
3. History of Agriculture and Rural Law; Veterinary Science; Practical Entomology or Landscape Gardening.

HORTICULTURAL COURSE.

Students wishing to make a specialty of Horticultural studies will in the third and fourth years of the Agricultural course substitute for certain of the above the following:

1. Pomology and Forestry.
2. Floriculture; Plant Houses and their Management.
3. Landscape Gardening.

COLLEGE OF ENGINEERING.

SPECIAL FACULTY.

The Regent,	Professor Roos,
Professor Ricker, Dean,	Professor Woods,
Professor Shattuck,	Professor Sondericker,
Professor Baker,	E. A. Kimball.

SCHOOLS.

Mechanical Engineering, Architecture,
Civil and Mining Engineering.

SCHOOL OF MECHANICAL ENGINEERING.

OBJECT OF THE SCHOOL.

The School seeks to prepare students to invent, design, construct and manage machinery for any branch of manufactures.

APPARATUS AND EQUIPMENTS.

The Machine shop is a substantial brick structure, erected in 1871, for the purposes of this School, with that of Architecture and Military Tactics. It has a sixteen-horse power engine, and the machine tools most needed, including a planer, two engine and three plain lathes, drilling machines, etc. There is a pattern shop, a blacksmith shop, and the requisite amount of vises and bench-room. A collection of models and machines serves to illustrate peculiar structures and methods of applying force. This School is provided with plates and a cabinet of models, illustrating mechanical movements and elementary combinations of mechanism. This collection is rapidly increasing by our own manufacture, and by purchases from abroad. It includes many of Riggs' models, and others from the celebrated manufactory of J. Schroeter, of Darmstadt, Germany. About two hundred valuable models from the United States Patent Office are also included in the cabinet.

INSTRUCTION.

The elementary course in Mechanics begins with the second term of the Freshman year, following a term of elementary plane drawing, and continues to the end of the year. The student begins in the Pattern shop, and is taught to produce simple forms of wood, and wood-turning. From this work he goes to the Blacksmith shop, where he practices drawing, squaring, bending, welding, and otherwise fashioning iron. Returning to the Machine shop, he learns to cut off, center and drill wrought and cast iron. He gives much time at the bench in finding surfaces and forming shapes with the cold chisel and the file. His next lessons are at the hand lathe in turning iron and brass, and afterward at the engine lathe and the planer in turning, cutting screws, and in facing up various forms. In all this work he is under the constant supervision of a watchful master, who holds him strictly to correct methods, and makes him accountable for accurate results.

The object of this work is to teach correct ideas of the use and care of tools, and the development of forms, and the only result sought is accurate workmanship. The pieces, when finished, may go upon the scrap-pile, or into the melting-pot, if not wanted for samples.

In the second year, the student is employed upon some form of actual construction. The interest pertaining to doing a new thing is increased by giving that new thing a recognized utility. Some form of machine is chosen, such, for example, as the need of the shop itself may require. The subject is taken into the Drawing-room, its purposes and requirements are fully discussed, and the steps of the design are worked out. If at all complex, the whole class works upon the same drawings until the design has crystallized into definite shape. Then the parts are assigned to individuals. One takes a wheel, another a piece of the frame, or if the item be large, two persons work together upon it; detailed drawings are made and offered for inspection. If found satisfactory, the drawing is taken to the Pattern shop and the pattern is made, which must also undergo

rigid inspection before it can go forward to the Foundry. Thence the rough casting goes to the Machine shop, and receives such finishing, by such methods and with such tools, as the case may require. Thus the Sophomore class of 1879-80 have built the heavier parts of a large drill press. The standard of this machine is 84 inches high; its circular table 25 inches in diameter, swings on the main pillar, and is raised and lowered by rack motion; it will be adapted for automatic or hand feed; its spindle will have a quick return motion; it has the usual fast and loose pulleys and back gears for use in boring large openings. In all respects the machine will be first-class. Having furnished class instruction to the class of last year, it is now doing a similar service to the present class, which will finish it during the present term. When complete all the work upon it will have been done by the students of the University, except the cutting of the gears, for which the shop has, as yet, no suitable machinery. The building of a milling machine will furnish useful instruction to classes yet to come.

The students of the higher classes have a greater proportion of theoretical work, which their practical training will the better enable them to appreciate and profit by, with drawing and as much construction as time will permit. The commercial work which comes to the shop gives paid employment to the older pupils, whose elementary and practical courses have prepared them for such work. There is usually as much such work as the students have time for.

As in the other Schools, the time required to complete this full course is four years; the student taking, with the above, literary and scientific studies sufficient to keep him busily occupied during this time.

PHYSICS.

This subject is connected, in the professorship, with the foregoing; hence introduced in this place.

The apparatus has cost about five thousand dollars. Much of it is adapted for investigation, rather than illustration. The room is over the chapel, and like it is 60 feet by 80 feet; a transverse partition divides it equally. The northern part is used as a lecture room, and is capable of seating 350 persons, if necessary. The southern room is the laboratory, a beautiful apartment, having abundant light from the east, south and west. In the center of this room a case for apparatus has been enclosed, 16 by 20 feet, the upper part being made useful by a gallery. This case is glazed on three sides; the lower part affords abundant opportunity for the display of pieces of interest, while the gallery gives place for many things not less useful, though less attractive. Between the apparatus room and the lecture room is a space designed, primarily, as an ante-room for the lecture room, and having its floor on a level with the lecture platform. This room communicates, both above and below, with the apparatus room in its rear, and by ample sliding doors with the lecture room in front. Even if the lecture room is occupied, preparation may be made in the ante-room for a succeeding exercise, and at the time for change the required apparatus may be transferred in an instant, through the broad doorway. The

ante-room, when closed, becomes a dark room, admirably adapted to such experiments as require total absence or perfect control of light. The ante-room and apparatus room occupy the center and on one side of the laboratory, leaving a space on the remaining three sides in which 50 students could work together, if occasion should require. Here are arranged the several forms of apparatus required for the experiments.

The study of physics occupies two college terms, in which there are each week five recitations from a text-book, one lecture and four hours of laboratory practice. In the latter, a series of about forty experiments are performed by each student, two working together according to a programme arranged for the purpose. Besides the written directions for the method of procedure, the student has the aid of the Professor and his assistants, when needful. Careful notes and calculated results are required, on paper of a given size.

MECHANICAL ENGINEERING COURSE.

Required for the Degree of B. S., in School of Mechanical Engineering.

FIRST YEAR.

1. Trigonometry; Projection Drawing; Shop Practice; French or German.
2. Analytical Geometry; Descriptive Geometry or Lettering; Shop Practice; French or German.
3. Calculus; Free Hand Drawing; Shop Practice; French or German.

SECOND YEAR.

1. Designing and Construction of Machines; Advanced Algebra; German or French.
2. Advanced Analytical Geometry; Designing and Construction of Machines; German or French.
3. Advanced Calculus; Astronomy; German or French.

THIRD YEAR.

1. Mechanism and Mechanical Laboratory; Advanced Descriptive Geometry; Chemistry and Laboratory Practice.
2. Analytical Mechanics; Chemistry and Laboratory Practice; Physics.
3. Analytical Mechanics; Modern History; Physics.

FOURTH YEAR.

1. Resistance of Materials and Hydraulics; Geology; Mental Science.
2. Prime Movers; Constitutional History; Construction Drawing.
3. Mill Work; Designing and Laboratory Practice; Political Economy.

In this course the student will take two years of French or German, but not one year of each.

SCHOOL OF CIVIL ENGINEERING.

OBJECT OF THE SCHOOL.

The School is designed to furnish a course of theoretical instruction, accompanied and illustrated by a large amount of practice, which will enable students to enter intelligently upon the various and important duties of the engineer.

INSTRUCTION.

The instruction is given by lectures, text-books and reading, to which are added numerous problems and practical exercises, as serving best to explain completely subjects and fix them in the mind. Models and instruments are continually used, both in lectures and by the students themselves.

COURSE OF STUDIES.

The studies taught in this School, as belonging specially to it, are as follows: Projection Drawing, Ornamental Drawing and Lettering, Topographical Drawing and Mapping, Descriptive Geometry, Land Surveying, Topographical Surveying and Leveling, Road and Railroad Engineering, Geodetic Surveys, Practical Astronomy, Descriptive Astronomy, Analytical Mechanics, Bridge Analysis and Designing, Bridge Construction, Foundations and Stone Work. Students of this School pursue studies in other schools of the University. Arrangements are making for an advanced or post-graduate course in Civil Engineering, which will include the following special subjects: Advanced Bridges, Tunnelling, Water Supply Engineering, Harbor and River Improvements, Arches and Stone Work, Drainage and Sanitary Engineering, Practical Astronomy, Theory of Least Squares.

APPARATUS.

For Field Practice.—The School has an equipment of instruments for instruction in Engineering in field work, including chains, tapes, compasses, plane tables, transits, stadias, levels, base rods and comparing apparatus, barometer for barometical levelling, sextants, engineer's transits arranged for astronomical observations, an observatory which is provided with an equatorial telescope, an astronomical transit, a zenith telescope, a chronometer, and a set of meteorological instruments.

A portable altitude and azimuth instrument of the latest and best form has lately been received from the celebrated makers, Troughton & Simms, of London. It is read by micrometer microscopes to single seconds, both of altitude and azimuth. This instrument will be used for instruction in Geodesy and Practical Astronomy.

To facilitate practice in trigonometrical and land surveying, an area has been specially prepared in which the difficulties of plane surveying are presented to the beginner as he is able to meet them, and where he is taught practical methods of overcoming them.

For the Lecture Room.—Models for illustrating the subjects of Descriptive Geometry, Astronomy, Roof and Bridge Trusses, Arches and Stone Work, and Railroad Superstructure. The School has a collection of students' manuscripts and drawing, and of authentic designs of bridges, roofs and engineering structures. It has also a complete set of maps of both the Coast and Lake Surveys. The College of Engineering has received the very large and excellent collection of lithographs of the lectures and drawings used in the Governmental Polytechnical Schools of France. The students of this

School are steadily growing in favor with those seeking engineering services. During the past summer the demand was greater than the supply. Nearly all of the graduates are filling positions of responsibility and trust in their profession.

Students in Mining Engineering have all the facilities of the School of Civil Engineering, but instead of pursuing the special studies not closely related to their course, they have instruction in Metallurgy and Analysis of Coal, Mineral Waters, etc. The Geological and Mineralogical cabinets are well furnished with useful specimens, and the Metallurgical and Assaying laboratories have stamp-mill, furnaces, and other apparatus required for practical instruction in this department.

CIVIL ENGINEERING COURSE.

Required for Degree of B. S., in School of Civil Engineering.

FIRST YEAR.

1. Trigonometry; Projection Drawing; French or German.
2. Analytical Geometry; Descriptive Geometry and Lettering; French or German.
3. Calculus; Free-Hand Drawing; French or German.

SECOND YEAR.

1. Advanced Algebra; Land Surveying; German or French.
2. Advanced Analytical Geometry; Theory of Instruments and Surveying; German or French.
3. Advanced Calculus; Topographical Surveying and Drawing; German or French.

THIRD YEAR.

1. Advanced Descriptive Geometry; Chemistry and Laboratory Practice; Railroad Engineering.
2. Analytical Mechanics; Chemistry and Laboratory Practice; Physics.
3. Analytical Mechanics; Astronomy; Physics.

FOURTH YEAR.

1. Resistance of Materials and Hydraulics; Mental Science; Geodesy and Practical Astronomy.
2. Bridges; Constitutional History; Geology.
3. Stone Work; Political Economy; Bridge Construction.

In each of these two courses the student will take two years of German or French, but not one year of each.

SCHOOL OF ARCHITECTURE.

OBJECT OF THE SCHOOL.

The School prepares students for the profession of Architecture. For this a thorough knowledge of scientific principles applied to building, ability and correct taste in design, and a technical knowledge of the various building trades, with skill in the use of tools, are necessary, and are prominent objects of the course of instruction.

INSTRUCTION.

The work of the School of Architecture, in imparting instruction and its aims and methods, may be classified under four heads:

1. The imparting of technical information.

2. Training in the use of tools and methods employed in the building trades.

3. Training in the use of drafting instruments and materials.

4. Training in the art of original design.

1. *Technical Information*—Is given as to the materials and methods employed in the various building trades; a knowledge of the preparation of legal papers, contracts, agreements, specifications and estimates of cost; also a knowledge of the various architectural styles and their most prominent examples. This knowledge is almost wholly imparted by lectures, as few text-books are available, and they are illustrated by engravings, photographs and sketches with reference to work in the library. The lectures are concise, written with a type-writer on transparent paper, and are then copied by the "blue" process. In this way each student can obtain a complete copy at much less cost than he can write it out for himself. The text is read more easily than manuscript, being in print. The lectures can be made as full and complete as desired, instead of being limited by the time of delivery, as is usually the case. Illustrations are also drawn on transparent paper and printed in the same way.

Training in the Use of Tools.—The object of this is two-fold:

1. To give the student such knowledge of a trade, that if he meet with reverses in life, he will still have a means of honestly earning a living, or that he may do the work which is often required about a residence on a farm.

2. To teach the student practically the methods of construction which are in use in building, the proper use of the tools, and above all to know how work should be done, and the difference between good and bad work, so that he may know that good materials have been used and that the work has been well done. The special object of this is to prepare a student for taking charge of the construction of a building, as superintendent or architect, rather than to fit him merely for working at a trade. One year of honest work in the classes in shop practice proves sufficient to attain this result.

3. *Training in the Use of Drafting Instruments.*—This study develops manual skill, cultivates habits of neatness and accuracy, ascertains the peculiarities of the materials and colors employed, and presents methods of finishing drawings and of distinguishing the different materials when these are required to be shown. The system of instruction is progressive. It commences with accurate line-drawing, then takes up shading in ink, sepia, line, and finishing in full color. About one-half the time is spent in making sets of the working drawings which are required for a building, from copies, from small sketches, and, when the student has become more proficient, from a small plan and a sketch in perspective, which is usually taken from one of the architectural journals.

4. *Training in the Art of Design.*—Correct taste and the power of designing necessary to make the indispensable things of life beautiful, form the keystone in the education of the architect. After a student can make a good set of drawings from a sketch or small perspective, a programme of conditions and requirements for a small building is given to him. This is followed by others, increasing in difficulty as he acquires power, and ending with the most difficult structures which an architect is called upon to erect, except public buildings, which are reserved for the post-graduate course. In studying these problems, sketches at a small scale are first made and changed until satisfactory, great attention being paid to arrangement and convenience of plan. From these the student prepares a full set of working drawings neatly colored and shaded. Working drawings, similar to those made in architects' offices, are preferred to fine drawings, though as much time as can be spared is given to this branch of the art.

APPARATUS AND EQUIPMENTS.

The facilities for instruction at the School of Architecture are: 1. An excellent library. 2. The use of a fine art gallery, containing casts of sculptures, ornaments, and many photographs of buildings. (See School of Art and Design). 3. A good and rapidly increasing collection of models illustrating construction. 4. Tools and materials and instruction furnished in shop practice free of cuarge. 5. American, English, French and German architectural periodicals are regularly taken in the library.

The new Chemical Laboratory was designed by the Professor of Architecture, assisted by students of the course. Many other pieces of work for the University have originated in the same way. A school house at Rankin, Ill., was designed by an undergraduate student. It has given good satisfaction. Graduates are becoming well established as architects in several Western cities.

ARCHITECTURAL COURSE.

Required for the Degree of B. S., in School of Architecture.

FIRST YEAR.

1. Trigonometry; Projection Drawing; Shop Practice; French.
2. Analytical Geometry; Descriptive Geometry and Lettering; Shop Practice; French.
3. Calculus; Shop Practice; French.

SECOND YEAR.

1. Elements of Construction; Advanced Algebra; Free Hand Drawing and Modeling.
2. Elements of Construction; Advanced Analytical Geometry; Architectural Drawing and Designing.
3. Advanced Calculus; Graphical Statics; Water Color Sketching.

THIRD YEAR.

1. Architectural Drawing; Descriptive Geometry and Drawing; Chemistry and Laboratory Practice.
2. History of Architecture; Analytical Mechanics; Physics.
3. History of Architecture; Analytical Mechanics; Physics.

FOURTH YEAR.

1. Esthetics of Architecture; Resistance of Materials and Hydraulics; History of Civilization.
2. Architectural Designing; Constitutional History; Geology.
3. Estimates, Agreements and Specifications; Heating and Ventilation; Architectural Designing; Political Economy.

BUILDER'S COURSE.

The Trustees allow persons desiring to fit themselves for master builders to take a course of a single year, pursuing such technical studies of the course in architecture as they may be prepared to enter upon with profit, and as will be most advantageous to them.

Candidates for the Builder's course must pass the examinations in the common branches, but need not pass in the studies of the preliminary year unless they shall desire to pursue other studies than those marked in the following schedule. Fee, $10 per term.

1. Wood Construction; Projection Drawing; Shop Practice (Carpentry and Joinery.)
2. Stone, Brick and Metal Construction; Agricultural Drawing; Shop Practice (Stair Building.)
3. Estimates, Agreements and Specifications; Heating and Ventilation; Architectural Designing; Shop Practice (Cabinet Making.)

COLLEGE OF NATURAL SCIENCE.

SPECIAL FACULTY.

THE REGENT.

Professor BURRILL, Dean,
Professor PRENTICE,
Professor MCMURTRIE,
Professor JILLSON,
Professor ROLFE,
Mr. PALMER.

SCHOOLS.

School of Chemistry. School of Natural History.

SCHOOL OF CHEMISTRY.

This School aims to impart such knowledge of Chemistry as will enable the student to apply the principles of the science to the related arts, and to fit him for the field of original research, or for the practical business of the druggist, pharmacist and practical chemist.

INSTRUCTION.

Text-book instruction in the principles of Chemistry and Chemical Physics occupy six weeks of the first term of the first year. Afterward the recitations, alternated with laboratory practice. During the

next three years each student is expected to work two hours daily in the laboratory, five days in the week. In order to graduate, each is required, at the close of his course, to make an original investigation, and present a thesis.

Students who pursue Chemistry as a part of other courses work at least two consecutive hours daily during such time as their specialty may require.

The special Chemical course requires for its completion four years of study. Associated with this there have been established a four years' course in Pharmacy and three years' courses in Agricultural Chemistry and Metallurgy.

APPARATUS.

The facilities offered for obtaining a practical knowledge of Chemistry are believed to be unsurpassed by those of any other institution in the West. A large laboratory building 75x120 feet, and four stories in height, was erected 1877-8, at an expense, including furniture, of $40,000. It is excellently lighted, heated and ventilated, and contains the following apartments: One large lecture room, with seating capacity for two hundred students; one small lecture room for advanced students; a large laboratory for qualitative analysis, containing one hundred and four desks; a large laboratory for quantitative analysis, etc., containing sixty-four desks; a pharmacy, with collection of specimens for *materia medica* and of officinal preparations made by students; a room for gas analysis; an assay room; store rooms, and a photographic gallery and other apartments.

The apparatus for general use includes a large platinum retort for the preparation of hydrofluoric acid; a Dove's polarizer, with a complete suit of accompanying apparatus; a Geissler's mercurial air pump; Hoffman's apparatus for illustrating the composition of compound gases; a Soliel-Scheibler's saccharimeter; an excellent set of areometers; a Hauy's goniometer; a camera with Ross' lenses; a Ruhmkorff's coil; galvanic batteries of Grove and Bunsen; also a potassium dichromate battery, a galvanometer, a spectroscope, and a large binocular microscope; a Hartnack microscope; a gas combustion furnace for organic analysis, etc.

COURSE IN CHEMISTRY.

Required for Degree of B. S., in School of Chemistry.

FIRST YEAR.

1. Chemistry and Laboratory Practice; Trigonometry; American Authors or French.
2. Chemistry and Laboratory Practice; Analytical Geometry; British Authors or French.
3. Organic Chemistry and Laboratory Practice; Free Hand Drawing; Rhetoric or French.

SECOND YEAR.

1. Agricultural Chemistry; Laboratory Practice; Physiology or Botany; German.
2. Agricultural Chemistry; Laboratory Practice; Microscopy; German.
3. Laboratory Practice; Zoölogy; German.

THIRD YEAR.

1. Laboratory Practice; Mineralogy; German.
2. Laboratory Practice; Physics; German.
3. Laboratory Practice; Physics; German.

FOURTH YEAR.

1. Laboratory Work; Mental Science; Meteorology and Physical Geography.
2. Constitutional History; Laboratory Work; Logic.
3. Political Economy; Geology; Laboratory Work.

Four courses of Laboratory work have been arranged, as follows:

CHEMICAL COURSE.

FIRST YEAR.

First Term.—Qualitative Analysis; Tests and Separation of the Alkalies, Alkaline Earths, N H_4 2S Group, and 1st and 2d Divisions of H_2S Group.

Second Term.—Qualitative Analysis Complete; Tests, and the Separation of 3d Division of H_2S Group, and the Acids; Analysis of 20 Simple Salts, and 20 Compound Substances.

Third Term.—Qualitative Analysis of Sodium Sulphate, Dolomite, Ammonium, Alum, Potassium Chloride, Bone Ash, Iron Ore.

SECOND YEAR.

First Term.—Quantitative Analysis of Calamite (Zinc Carbonate), Copper Pyrites, Galena, Spathic Iron Ore, Nickel Ore, Clay, Soil; Determination of Iron, Copper, etc., both volumetrically and gravimetrically.

Second Term.—Volumetric Analysis; Alkalimetry and Acidimetry; Preparation of Standard Solutions; Analysis of Sodium Carbonate, Sodium Hydroxide, Potassium, Hydroxide, Pearl Ash, Cream of Tartar, Sulphuric, Hydrochloric, Oxalic, and Citric Acids; Analysis of Corn and other Grain.

Third Term.—Preparations of Salts, Acids, etc. Electroplating with Silver, Gold, Copper, Nickel.

THIRD YEAR.

First Term.—Ultimate Analysis; Determination of Carbon, Hydrogen, Oxygen, Nitrogen, Chlorine, Phosphorus, and Sulphur in Organic Compounds; Analysis of Urine.

Second Term.—Blow Pipe Analysis; Determination of a collection of minerals representing over thirty of the Metals; Assaying in both the dry and wet way of Gold, Silver, and Lead Ores.

Third Term.—Photography; Preparation of Ether; Absolute Alcohol, Gun Cotton, Cadmium Iodide, Ammonium Iodide, Glacial Acetic Acid, Silver Nitrate, Collodion, Taking Negatives, Printing Positives, Toning and Mounting.

FOURTH YEAR.

First Term.—Gas Analysis; Calibration of Eudiometers; Analysis of Air from Lungs, Atmospheric Air, Marsh Gas, Illuminating Gas, and Crude Coal Gas; Analysis of Mineral Waters,

Second Term.—Toxicology; Micro-Chemistry of Poisons; Testing for Minerals and Vegetable Poisons; Separation from Organic Mixtures.

Third Term.—Original Researches.

PHARMACEUTICAL COURSE.

FIRST YEAR.

Same as in Chemical course.

SECOND YEAR.

First Term.—Quantitative Analysis of Commercial Drugs, White Lead, Red Lead, Paris Green, Sodium, Nitrate, Oxalic Acid, Tartar Emetic, Commercial Hydrochloric, Nitric, and Sulphuric Acids.

Second Term.—Analysis of Mineral Waters; Preparation of Tinctures, Solid and Fluid Extracts; Reading and Compounding Prescriptions.

Third Term.—Isolation of Alkaloids, Atropine, Strychnine, Quinine, Nicotine, Aconitine, Morphine; Preparation of Salycilic Acid; Examination of Alcoholic Liquors; Reading and Compounding Prescriptions.

THIRD YEAR.

First Term.—Same as second term, second year of Chemical course.

Second Term.—Same as first term, third year of Chemical course, without Analysis of Urine; Reading and Compounding Prescriptions.

Third Term.—Preparation of Salts, Perfumes, Flavoring Extracts, Cosmetics; Electroplating with Gold, Silver, Copper and Nickel.

FOURTH YEAR.

First Term.—Same as second term, fourth year, of Chemical course.

Second Term.—Analysis of Urine, normal and pathological; Reading and Compounding Prescriptions.

Third Term.—Original Researches.

AGRICULTURAL COURSE.

FIRST YEAR.

Same as Chemical course.

SECOND YEAR.

First Term.—Quantitative Analysis of Feldspar, Soil, Ashes of Plants and Grains.

Second Term.—Analysis of Commercial Fertilizers, Manures, and Minerals used for Fertilizers.

Third Term.—Preparation of Organic and Inorganic Salts; Starch from Potatoes, Corn, Wheat, etc., Sugar, Dextrine, Alcohol.

THIRD YEAR.

First Term.—Same as Chemical course.

Second Term.—Analysis of Milk, Corn, Wheat, Potatoes, Fruits, etc.

Third Term.—Silt Analysis of Soils; Analysis of Mineral Waters.

METALLURGICAL COURSE.

FIRST YEAR.

Same as in Chemical course, with the Quantitative Analysis of Brass, Solder, and Type Metal in third term.

SECOND YEAR.

First Term.—Same as Chemical course.

Second Term.—Assaying of Gold, Silver, and Lead Ores, both dry and wet ways; Blowpipe Assaying.

Third Term.—Analysis of Malachite, Azurite, Cinnabar, Tin Ore, Cobalt and Nickel Ore, containing Arsenic, Bog Manganese, Gray Antimony.

THIRD YEAR.

First Term.—Analysis of Pig Iron, Wrought Iron, Steel, Furnace Slags, Rolling Mill Slags and Cinders.

Second Term.—Same as in Chemical course, with Analysis of Mineral Waters in place of Assaying.

Third Term.—Same as second term, fourth year, of Chemical course, with Analysis of Coal in place of Mineral Waters.

SCHOOL OF NATURAL HISTORY.

The aim of this School is to give a liberal scientific education. It acquaints the student as far as possible with what is known in respect to the structure of the earth and to the origin and distribution of its organic products; teaches him to collect and preserve specimens and arrange them for study, and to conduct original investigations.

The special studies of the course are: Botany and Vegetable Physiology, three terms, after one of preparatory study; Anatomy and Physiology; Zoölogy, three terms; and one term each of special Entomology; Osteology and Taxidermy; Geology and Palæontology, two terms; Physical Geography and Meteorology; Mineralogy; Astronomy, and Microscopy. The course occupies four years.

INSTRUCTION.

The methods of instruction vary according to the subjects taught, the time given to them, the facilities at hand and the aims of the instructors. It is the constant endeavor to make the course thoroughly practical and useful from an educational stand-point as well as to give the kind of knowledge necessary for the mastery of the material world.

APPARATUS AND EQUIPMENT.

The Botanical Laboratory has a growing herbanium, containing about eleven hundred and fifty species of flowering plants out of the fifteen hundred known in Illinois, a large number of flowering plants from other States and countries of the world, and a considerable collection of flowerless plants. Among these the Ferns and Fungi are the most important. There are compound microscopes and apparatus sufficient for use in the classes, so that during certain portions of his course every student has ample practice with them. Collections of woods, of fruits, dry and alcoholic, of plaster casts, of microscopic preparations, of charts and drawings, make up, together with the green house and its specimens and the library, the facilities for the study of Botany and Vegetable Physiology. A considerable collection of insects, especially of those inhabiting our own State, aids in the study of Entomology. Most prominent, however, in the equipments of the School is the

NATURAL HISTORY MUSEUM.

The room for the Natural History collection is on the first floor of the west wing of the main building. From north to south it is seventy-six feet long; it is sixty feet wide and sixteen feet high. On the west side are six large windows, and on the south, three, which ordinarily afford abundant light.

Covering the entire wall on the east, and the spaces between the windows on the south and west, are two stories of wall cases; they are separated by a gallery on the three sides of the room, which is reached by iron stairs at the northeast and northwest corners. These cases, with continuous shelving, are eight feet high, provided with glazed doors.

There are also, on each side of the room, opposite the spaces between the windows, five upright glazed cases, for the reception of such large specimens as could not be accommodated in the wall cases. The two extreme ones on either side are 10 feet 8 inches by 6 feet; and the three middle ones are 10 feet 8 inches by 3 feet 6 inches; all 8 feet high.

Directly opposite the windows, so as not to obscure the light, and between the floor cases on each side of the room, are table cases, glazed at top, sides and ends, for the reception of shells, minerals, or any small specimens. All this work of wood and iron was done at the University shops, and chiefly by the students of the architectural and mechanical classes.

A large case, 15 feet by 6 feet, and uniform with the rest, occupies the south end of the room, for the preservation of archæological specimens, Indian relics, and whatever else may be deemed worthy or instructive in teaching the progress of civilization.

Arrangement of Contents.—On either side of the central space are arranged the large casts of Ward's collection of remarkable fossils. Directly in front, towards the south end, stands the gigantic *Megatherium*. Largely covering the north wall hang the slabs of the immense Saurian reptiles. The remainder of this remarkable collection of casts of fossils, numbering in all three hundred and twenty-six, are arranged in the lower wall cases at the south end of the room, and on the tops of the floor cases. This most valuable set of casts was presented to the University, when it had almost no cabinet, by Hon. Emory Cobb, President of the Board of Trustees.

The entire east side wall cases are occupied by small mammals, birds and skeletons; the mammals beginning on the north below, and occupying about one-third of the length of the room. The birds follow, arranged at present according to the system of Dr. Cowes. These occupy the remaining east cases below, and about two-thirds of the north part of the gallery. The remaining third is filled with skeletons of such animals as can be accommodated there.

On the south in the gallery, beginning at the east end, the first case contains the articulates; the second, the reptiles; the third, the fishes; the fourth, the radiates.

The floor cases on the west side contain the large ruminants (elk, deer, moose, mountain sheep and antelopes.) On the east a mounted buffalo with its skeleton, and skeletons of other large mammals. Part of the table cases contain sea, land and fluviatile shells, of about 1,700 species. The rest contain minerals and fossils. The cases on the west wall, below and above, are appropriated to geological specimens, rocks and fossils.

Almost the entire collection of mounted specimens has been put up at the University, and chiefly by the students themselves, many of whom are very expert. The skins have been bought or donated, and skilled labor applied at home. Thus all the large ruminants and the smaller mammals are home products. The birds, also, excepting six or eight, are products of the University. By this means half or more of the expense has been saved.

In Osteology, where specimens are usually expensive, many fine and valuable skeletons have been mounted at a comparatively small expense. The bones of the larger animals are macerated for six to twelve months; neatly cleaned, bleached and properly fastened together by wires. These are called "artificial skeletons." Small

mammals, birds, fishes and reptiles have their bones carefully scraped, leaving the joints connected by their natural ligaments; hence, these are called "ligamentous skeletons."

The Museum is peculiarly fortunate in its collections in Zoölogy, possessing, in mounted specimens or skeletons, nearly all the ruminants of North America, except the musk ox; and representatives of all orders of mammals, except *Probocidæ;* exhibiting 50 species by 80 mounted specimens, with numerous skeletons. In birds, it represents all the families of North America, having 240 species represented by over 300 specimens. Its fishes are about 300. Its articulates and radiates have received valuable accessions from the Smithsonian Institute.

All donations which are preserved as specimens in the Museum, have the contributor's name placed upon the label, *as donor*. Also, a book is kept, in which these names are entered, alphabetically, with specimen contributed. For contributions valued at more than fifty dollars, there is a special bulletin hanging in the Museum upon which the names of such contributors are written, with a statement of the donation and its valuation.

CCURSE IN SCHOOL OF NATURAL HISTORY.

Required for the Degree of B. S., in School of Natural History.

FIRST YEAR.

1. Chemistry; Free Hand Drawing, (optional); Trigonometry; French.
2. Chemistry; Free Hand Drawing, (optional); Conic Sections; French.
3. Chemistry or Free Hand Drawing; Economic Entomology; Rhetoric; French (extra).

SECOND YEAR.

1. Zoölogy; Botany; German.
2. Zoölogy; Botany; German.
3. Zoölogy; Vegetable Physiology; German.

THIRD YEAR.

1. Anatomy and Physiology; Mineralogy; German; Ancient History (optional, extra).
2. Geology; Physics; German; Mediæval History (optional, extra).
3. Geology; Physics; Modern History.

FOURTH YEAR.

1. Physiography; History of Civilization; Mental Science.
2. Microscopy; Constitutional History; Logic.
3. Natural History Laboratory Work; Astronomy; Political Economy.

In this course three terms of University Latin will be accepted in lieu of three terms of French; and five terms of such Latin for five terms of German.

COLLEGE OF LITERATURE AND SCIENCE.

SPECIAL FACULTY.

THE REGENT,
Professor SNYDER, Dean,
Professor PICKARD,
Miss E. M. HALL.
Professor SHATTUCK,
Professor CRAWFORD,
Miss M. E. DARROW,

SCHOOLS.

English and Modern Languages.
Ancient Languages and Literature.

OBJECT OF THE SCHOOLS.

The object of the Schools in this College is to furnish a sound and liberal education to fit students for the general duties of life, and especially to prepare them for those business pursuits which require a large measure of literary and scientific knowledge and training. They meet the wants of those who wish to prepare themselves for the labors of the press as editors or publishers, for teachers in the higher institutions, or for the transaction of public business.

Students in the Agricultural and other technical Schools, desiring to educate themselves as teachers, writers, and professors, in their special departments, require a knowledge of the ancient, as well as the modern languages, to give them a full command of all the instruments and facilities required for the highest proficiency in their studies and proposed work. The University seeks through these Schools to provide for this important part of its mission—the furnishing of teachers to the industrial schools of the country, and investigators and writers for the arts.

INSTRUCTION.

The plan of instruction embraces, besides the ordinary text-book study, lectures and practical exercises in all the departments, including original researches, essays, criticism, proof-reading and other work intended to illustrate the studies pursued, and to exercise the student's own powers. It is designed to give to all the students voice culture and a training in elocutionary practice.

A prominent aim will be to teach the right use of books, and thus to prepare the student for self-directed investigation and study, which will extend beyond the curriculum of his school and the period of his graduation. With this view, constant use of the already ample and continually enlarging stores of the library will be required and encouraged. As a further aid in this direction, members of the advanced classes are usually selected to act as assistant librarians. In this service they are able to obtain much

valuable knowledge of various departments of literature and science, of prominent authors, and the extent and scope of their writings. Of special value, as an incentive to, and the means of practice in, English composition, should be mentioned THE ILLINI, a semi-monthly paper edited and published by the students of the several colleges, each of which is appropriately represented in its columns. A printing office has been provided in the Mechanical building, and is furnished with all requisite material.

THE LIBRARY.

This is a general collection of books and papers for the use of all departments of the University. It contained September 1, 1882, thirteen thousand five hundred and ten volumes, an increase in two years, since the last report of the Trustees of the University, of one thousand and sixty volumes. There are also between two and three thousand pamphlets. The number of the latter varies, since the more valuable ones are bound from time to time.

The library receives regularly, at present, eighty-seven periodical publications, divided as follows:

Agricultural and Horticultural	17
Engineering	18
Scientific	27
Literary and news	25

The amount expended in the library has been fifteen hundred dollars a year, for the two years, being the State appropriation for the library.

The fine Library hall is used as a reading room, from which, however, students are not allowed to take books, except by special permission. It is open five days in the week, from eight A. M. to five P. M., and Saturdays from two to five P. M.

The use of the library is urged upon students in all the classes; and any person is welcome to consult the books, under the same conditions as are imposed upon students.

GENERAL STUDIES.

Mathematics, History, Philosophy and Logic are more or less included in all the courses of study in the University; they are as appropriately mentioned here as elsewhere.

PURE MATHEMATICS.

The completion of this course requires two years of study.

Advanced Geometry.—Applications of Algebra to Geometry; Transversals; Harmonic Proportions, etc. *Trigonometry*—Analytical and Plane. Relations between the functions of an arc. Formation and use of tables; Solution of plane triangles. *Analytical Geometry.*—Construction of equations; Discussion, in a plane, of the point, right-line, circle, ellipse, parabola and hyperbola; Higher plane curves, cycloid, cissoid of Diocles, etc. *Differential Calculus.*—Differentials of algebraic and transcendental functions; Maclaurin's

Theorem; Taylor's Theorem; Maxima and Minima of functions of one variable; Equations of tangents, normals, sub-tangents, sub-normals, etc.; Differentials of lines, surfaces of volumes. *Integral Calculus.*—Integration of elementary forms and of rational fractions; Rectification of plane curves; Quadrature of plane areas and surfaces of revolution; and Cubature of solids of revolution.

Advanced Algebra.—Binomial Theorem; Properties and summation of series; Exponential quantities, Logarithms; General theory and methods of solving equations. *Analytical Geometry.*—Loci in space; Surfaces of the second order. *Differential Calculus.*—Differentials and Maxima and Minima of functions of two or more variables; Osculatory curves; Radius of curvature; Evolutes, involutes and envelopes; Discussions of algebraic and transcendental curves and surfaces; Tangent and normal planes; Partial differentials of surfaces and volumes. *Integral Calculus.*—Integration of transcendental and irrational differentials; Differentials of higher orders; Differential equations; Rectifications, quadrature and cubature in general. *Spherical Trigonometry.*—General Formulas; Solution of Spherical Triangles. *Calculus of Variations* will be taught to advanced students.

HISTORY AND SOCIAL SCIENCE.

The historical studies are designed to afford a general view of the history, social organization and progress of the race. They embrace also the history of the arts and sciences, and of civilization, the principles of civil polity and law, the philosophy of history, and the principles of political economy and constitutional law. The course occupies six terms in the third and fourth years of the University courses.

PHILOSOPHY AND LOGIC.

Mental Philosophy.—Analysis and classification of mental phenomena; theories of perception, consciousness, imagination, memory, judgment, reason. Mental Physiology, or connection of body and mind; healthful conditions of thought, growth and decay of mental and moral powers. Philosophy of education. Theory of conscience; Nature of moral obligation, moral feeling. The right. The good. Practical ethics; Duties. Formation of character. Ancient Schools of Philosophy; Modern Schools of Philosophy. Influence of Philosophy on the progress of civilization, and on modern sciences and arts.

Principles of Logic.—Conditions of valid thinking; forms of arguments; fallacies and their classification. Inductive and scientific reasoning; principles and methods of investigation. Practical applications of logic in the construction of argument, in the detection and answer of fallacies, and in the formation of habits of thinking, and the common judgments of life.

SCHOOL OF ENGLISH AND MODERN LANGUAGES.

English Language and Literature.—In the arrangement of the studies the endeavor is to present a thorough and extended drill in grammatical and philological study, and in the authors and history of the English language, affording a training equivalent to the ordinary studies of the classical language. This drill extends through three years of the course, but may be shortened according to the ability and preparation of the student.

The first two terms of the first year are given to a general survey of the whole field of British and American Literature from the middle of the sixteenth century to the present time. All the really representative writers come into notice, and representative specimens from the writings of each are carefully read in class. Moreover, each student is required each term to read the entire work of some classic author, making choice from a prescribed list. Frequent exercises in writing abstracts or original compositions on themes assigned are also required. The study of Rhetoric occupies the third term.

During the second year some four or five of the great masters are studied, their work analyzed, the shaping forces of their times and their influences upon succeeding times are investigated. Lectures are given from time to time on Poetry—epic, lyric, dramatic, etc. Writing and Reading required as in first year.

In the Senior year attention is given to old English; to the Anglo-Saxon, for which the way has been prepared by the study of both English and German; to Philology; to the Philosophy of English Literature, and to Æsthetics. Essays, forensics and orations are required.

French and German.—The modern languages taught in this School are confined to one year of French and two years of German. Abundant practical exercises are given both in composition and translation, and the diligent student gains the power to read with ease scientific and other works in these languages, and may, with a little practice, write and speak them with correctness. A constant attention is also given to the etymologies common to these languages and the English, and thereby a large advantage is gained by the student in linguistic culture. "He who knows no foreign tongue," said Goethe, "knows nothing of his own."

In the first year the student passes over a complete grammar and reader, acquiring a knowledge of the technicalities of the idiom, with a sufficient vocabulary for the use of books of reference within the course. The second year is devoted to a critical study of the languages and philological analysis, and to a course of select classic reading, composition and conversation.

COURSE IN SCHOOL OF ENGLISH ARD MODERN LANGUAGES.

Required for the Degree of B. L.

FIRST YEAR.

1. American authors or Cicero de Amicitia; French; Trigonometry.
2. British Authors or Livy; French; Conic Sections.
3. Rhetoric; French; Advanced Geometry, or Free Hand Drawing; Horace (optional extra.)

SECOND YEAR.

1. English Classics; German; Physiology, or Botany.
2. English Classics; German; Zoölogy, or Botany.
3. English Classics; German; Astronomy.

THIRD YEAR.

1. German; Chemistry; Ancient History.
2. German; Physics or Chemistry; Mediæval History.
3. German; Physics; Modern History.

FOURTH YEAR.

1. Anglo-Saxon; Mental Science; History of Civilization.
2. Early English; Constitutional History; Logic.
3. Philology; Political Economy; Geology.

SCHOOL OF ANCIENT LANGUAGES AND LITERATURE.

In the School of Ancient Languages and Literature the methods of instruction, without swerving from their proper aim, to impart a sufficiently full and critical knowledge of the Latin and Greek languages and writings, will make the study of these tongues subservient, in a more than usual degree, to a critical and correct use of the English. With this view, written translations, carefully prepared, with due attention to differences, equivalences, and substitution of idioms, and the comparison and discrimination of synonyms, will form part of the entire course.

The study of Latin and Greek Composition will constitute a weekly exercise through the first year, and will be continued, to some extent, through the course. Essays, historical and critical, will be required from time to time, in connection with the works read, and a free use of the library is urged. It is intended that each student who contemplates the course in Ancient Languages shall have a clear knowledge of the history of Greek and Latin Literature, and of the principal authors in both languages. As an aid to the appreciation of the literature of the two people, Greek and Roman history will form an important part of the course, and will be taken up in the beginning, illustrating the works read. In the first term of the third year ancient history is taken up as a separate study, and especial attention is then given to the history of Greece and Rome, and the nations with which they came in contact. Classes will be formed for students who wish to carry their classical study farther than the prescribed course, and every assistance will be given them.

For the studies in *History, Philosophy, etc.*, see School of English and Modern Languages.

For the studies in *Mathematics and Natural Science*, see Schools of Mechanical Engineering and Natural History.

COURSE IN SCHOOL OF ANCIENT LANGUAGES.

Required for Degree of B. A.

FIRST YEAR.

1. Cicero de Amicitia and prose composition; Iliad and prose composition; Trigonometry.
2. Livy and prose composition; Boise and Freeman's selections from Greek Authors and prose composition; Conic Sections.
3. Odes of Horace and prose composition; Memorabilia and prose composition; Advanced Geometry.

SECOND YEAR.

1. Satires of Horace; Thucydides or German; Physiology.
2. Terence; Sophocles or German; Zoölogy.
3. Tacitus; Demosthenes or German; Astronomy.

THIRD YEAR.

1. Juvenal or French; Chemistry; Ancient History.
2. Quintilian or French; Physics; Mediæval History.
3. De Officiis or French; Physics; Modern History.

FOURTH YEAR.

1. History of Civilization; Mental Science; Meteorology and Physical Geography.
2. Constitutional History; Early English; Logic.
3. Philology; Geology; Political Economy.

ADDITIONAL SCHOOLS, NOT INCLUDED IN THE FOUR COLLEGES.

SCHOOL OF MILITARY SCIENCE.

By the law of Congress, and of the State, the University is required to teach Military Tactics to its students. All able-bodied male students of the college classes of the first, second and third years, are enrolled in the companies of the University battalion, and receive instruction in the following military exercises:

School of the Soldier; Manual of Arms.
School of the Company; Movements by Platoons, Firing, etc.
School of the Battalion; Ployment and Deployment of Close Columns.
Battalion and Company Skirmish Drill; Bugle Calls.
Bayonet Fencing; Target Practice.
Guard and Picket Duties; Duties of Sentinels.

CLASS IN MILITARY SCIENCE.

Classes in military science and tactics, as far as is requisite for officers of the line. From these classes are selected the officers of the several companies, for which they act as instructors. The military instruction is now under the charge of Lieut. Wm. T. Wood, a graduate of the U. S. Military Academy, and an officer of the

regular army of the United States. A full supply of arms and ammunition is furnished by the War Department, including 300 cadet rifles and accoutrements, two pieces of field artillery, 1,000 ball cartridges and 1,000 blank cartridges annually for target practice, with 100 cartridges and 300 friction primers for artillery.

No student is eligible to the military class until he has reached the third term of the Freshman year, and is in good standing in all his studies. The course of instruction is confined strictly to two years. No student will be permitted to retain a command who does not maintain a good standing in conduct and scholarship.

The instruction and class exercises occupy about three hours each week, arranged as far as possible so as not to interfere with any other courses of study, to allow the members of other courses to enter this. Students must be careful, however, to ascertain, before entering the military class, that the proper studies and exercises of their chosen courses will not be interfered with.

Commissions.—The Governor of the State is accustomed to commission as captains, in the State militia, such graduates of the University as have completed the studies of the military classes and have obtained the requisite experience in command in the University battalion. In order to obtain the commission the student must be approved by the Faculty and pass satisfactorily an examination in military science and tactics before a committee appointed by the Faculty of the University. It is expected that in order to get the required experience in command, the members of the military class of the third or Junior year will serve as commissioned officers of the several companies of the battalion.

University Uniforms.—Under the authority of the acts of incorporation, the Trustees have prescribed that all male students, after the first term, shall wear the University uniform. The University cap is to be worn from the first. The uniform consists of a suit and a cap of cadet gray cloth. Students can procure them ready-made on their arrival here. The University cap is ornamented in front with the initials I. I. U., surrounded by a wreath. Students will always wear their uniforms on parade, but in their rooms and at recitations may wear other clothing.

The University Library contains many books on Military Science, Military History and Engineering.

Gymnasium.—The Drill Hall is furnished with a full set of gymnastic apparatus, and classes in gymnastic exercises are organized in the fall and winter terms under careful leaders. Fee 50 cents.

The University Cornet Band is composed of students, who, while members of the band, are excused from drill and other college exercises.

COURSE IN SCHOOL OF MILITARY SCIENCE.

FIRST YEAR.

1. School of the Soldier and Company; Bayonet Fencing.

SECOND YEAR.

1. School of Battalion; Skirmish Drill.
2. Ceremonies and Reviews; Military Signalling; Sword Fencing.
3. Guard, Outpost and Picket Duty; Military Signaling; Sword Fencing.

THIRD YEAR.

1. Military Administration; Reports and Returns; Theory of Fire Arms; Target Practice; Artillery Drill.
2. Organization of Armies; Art of War; Field Fortifications; Artillery Drill.

SCHOOL OF ART AND DESIGN.

The School of Art and Design, begun in 1876, occupies a large, well appointed apartment in a wing of the main University building. Light is admitted from three sides and managed by will by curtain partitions. The necessary tables, desks, easels, etc., are provided for large classes of students. In the center is a room of glazed sash for the convenient storing of copies and of examples of class work as well as the exhibition of objects requiring protection. In an adjoining smaller room there is a valuable collection of paintings and sketches, the property and mostly the work of the Professor in charge of the School. Students have access to this room.

The importance of having in the Illinois Industrial University a practical course of art instruction, was duly recognized by the authorities of the University. The exhibits made by the different art schools, both foreign and American, at the Philadelphia Exposition, revealed the fact that the most useful results had been attained by a mode of teaching quite different from that commonly practiced in our schools. During the years 1876 and '77, by direction of the Trustees, the classes in industrial drawing and designing were formed into a regular school, called the School of Art and Design. Its object was stated to be to assist in the general college work, and to furnish a thorough artistic education to those who should wish to pursue industrial or fine arts as a specialty, either as designers, teachers or artists. Such work as tends directly or indirectly to aid the general student is here briefly stated:

1. To develop the power of observation, that the eye may become susceptible to the beauties of the surroundings in nature, so as quickly to perceive and understand the laws of harmony, perspective, shades and color, and to realize complex forms, such as are found in plants, insects, etc.

5. The training of the hand to delicacy and skill in the use of mediums or implements wherewith to accomplish what the mind directs.

3. To familiarize the student with classical forms of objects, and ornamentation, so as to distinguish different styles, and to cultivate a correct taste.

A two years' elementary course embraces such studies as are especially important to various professions, and therefore meets the wants of the several colleges having free-hand drawing in their courses; besides, it qualifies for entering the higher course in Designing or Fine Arts.

The advanced course, instead of being arranged for a definite length of time, requires a more specific amount and quality of work. An important feature is the opportunity that students have for fitting themselves as practical teachers. Those who have acquired sufficient knowledge are frequently called upon to assist beginners. Lessons are prepared, which, after being criticised and approved, are delivered before the class. This inspires the student with confidence, makes a thorough review of a subject, and stimulates him to do his very best.

As soon as the student fairly appreciates decorative forms, he is taught to combine them artistically, so as to form original designs suitable for some practical purpose. The instruction is by lectures, illustrated by rapid drawings upon the board. Each student also receives individual attention after the lecture; this prevents any error passing unnoticed.

With very few exceptions, the students in attendance have proved themselves earnest workers, and many have exhibited marked talent; a number of ladies and gentlemen have produced some good work in oil colors and crayon. This last branch of art might be carried to a high state of success, even without special encouragement. It is, however, not so important to the industries of the State as the branch in designing.

ART GALLERY.

There is no more attractive place for great numbers of visitors at the University than its large and finely arranged Art Gallery, in the west wing of the main building, on the third floor. The cost has been about three thousand dollars, but this sum has been so expended that a display is made equal to that obtained by many times the outlay in many kindred collections. There are no paintings, for the limited means would not permit their purchase, nor could the results of the sum expended prove nearly so interesting and instructive by thus dividing it. The gallery owes its existence, in the first instance, to Dr. John M. Gregory, who originated the scheme, and, aided by the liberality of the citizens of Champaign and Urbana, selected and purchased the art objects. The larger portion of these were secured in Paris, France. To secure the needful means, lectures were given, whose proceeds went for this purpose; a subscription was taken up among citizens, including members of the Faculty, and other ways resorted to for raising the amount. The University furnishes the room; otherwise, the State

has been at no expense for the valuable and beautiful gallery. The following figures show the liberality of the donors; many contributed smaller amounts:

Six each gave	$100 00	Eight each gave	$50 00
Thirty-five each gave	25 00	One gave	40 00
Two each gave	20 00	Twelve each gave	10 00

The hall is 61×78 feet. The wall is tinted a dark maroon color, making a beautiful background for the white casts. The arrangement is such that a view is obtained, on entering, of nearly every thing in the room, the first sight being impressive, and ordinarily eliciting exclamations of surprise from the hundreds of visitors passing the threshold.

Statues.—There are sixteen full-sized statues, among which are the Laocoön Group, Venus de Milo, Venus de Medicis, Diana de Gabies, Faun of Praxiteles, Gibson's Venus, Dying Slave of Michael Angelo, etc. Of the reduced size statues, there are forty-two, including the Apollo Belvidere, Diana the Huntress, Achilles, Minerva, Dying Gladiator, etc. There are ninety-two full-size busts, representing famous persons of all ages, from Homer to many now living. Among these, we find ten Roman Emperors, Hippocrates, Socrates, Demosthenes, Cicero, Lord Bacon, Dr. Johnson, Gladstone, Washington, Webster, Douglas, Lincoln, etc. There are twenty-eight busts of smaller size from the best artists.

Bas-Reliefs.—Forty-two pieces. We name, as among the prominently noticeable ones, the Architrave of the celebrated Ghiberti gates in the Baptistery at Florence, Garden of Eden, Cain and Abel, Assyrian Sculpture excavated in 1848, Lion Hunt, Four Seasons, etc.

Medallion Heads.—Large size, twenty-seven; smaller, four hundred and ninety. These have their names stamped upon them.

Engravings.—There are fifty-four beautiful engravings from paintings by Raphael, Landseer, David, Hessig, Turner, Hogarth, etc.

Photographs.—Two hundred and thirty-two. Roman views, views of Venice, Switzerland, of noted paintings, of bas-reliefs, etc.

Portraits.—Four hundred and seven lithographs of eminent personages, mostly French, with name, date and other information marked on each.

COURSE OF INSTRUCTION IN SCHOOL OF ART AND DESIGN.

Students not seeking a professional training may yet avail themselves of the two years' course in industrial art. Any person of ordinary ability who faithfully completes this course will be qualified to teach drawing and designing in the public schools, or enter professions with great advantage in the various branches of industry, where artistic skill and taste are indispensable to success.

FIRST TERM.

(Exercises in outline.)

Elements of Form; Analysis of Compound forms; Elementary Designs: Elementary Perspective by aid of objects; Elements of Historic Ornaments; Memory Exercises.

SECOND TERM.

Enlargement and Shading from copy; Ornamental Designs from plant form; Naturalistic and Conventional Arrangement; Harmonious Lines and Distribution of Form; Perspective Drawing of Objects, Plants, etc.; Features of the Human Head; History of Early Art.

THIRD TERM.

Outline Drawing and Shading from Casts of Ornament; Application of Decorative Forms to flat and round surfaces under various conditions; Designs for specified objects; Advanced Perspective and Shadows; Harmony and Contrast of Color, (Lectures on Art and its History.)

FOURTH TERM.

(Clay and Wax Modeling.)

Basso Relievo Ornament from the Solid. Features and the Human Head from description; Relievo Ornament from shaded copies or Drawings; Original Designs for decorative purposes; Enlargements and Reduction from casts; History of Styles of Ornament.

FIFTH TERM.

Shading from Statuary, Casts, etc.; Drawing of Landscape and Animals from copy in charcoal and sepia; color applied to Decorative Art; designs for useful objects; perspective drawings of interiors of rooms.

SIXTH TERM.

General review of the principal work done; Specimen plates to be completed; Optical and Physical principles of color in Nature; Aerial Perspective; Sketching from Nature in charcoal and color; Artistic Anatomy of Form and Proportion, by illustrated lectures; famous artists and their principal works.

Students having passed satisfactorily in the above course will be permitted to enter the advanced classes.

The following course is for those who wish to become accomplished either as designers, painters or teachers. In order that the student may acquire thoroughness in the branch he wishes to pursue as a specialty, the subject has at this stage been formed into two divisions, decorative and pictorial. The teacher student must give attention to both branches, and with him theory will necessarily supersede practice. Opportunities will be afforded such pupils to teach in the elementary classes, whereby greater efficiency will be acquired.

SPECIAL COURSE IN PAINTING.

Trees, Animals and Figures from copy and from Nature, in pencil, charcoal and sepia; Aerial Perspective.

Anatomy of Expression; External muscular development; Shading from Statuary in charcoal and monochrome; Composition drawing from description; Memory Exercises.

Water-color Painting from pictures; Sketching from Nature in sepia and water colors; Copying from Oil Paintings of Portraits and Landscapes.

Sketching from Nature in oil-colors; Rapid studies of interiors with varied arrangement of light and shade; Pictorial composition, introducing figures of animals; Theory and History of Art.

Portrait Painting from life; Pictures finished from sketches; Studying of Groups of Still Life subjects; Painting of ideal compositions of one or more heads; Chemistry of color.

ADVANCED COURSE IN DESIGNING.

Studies in Clay or Wax.

Ornaments and Plant form in Basso Relievo from flat examples; Designs adaptative to useful objects; The Human Figure from cast or original composition, reproduced by casting in metal or plaster; Process of manufacture; Monumental designs.

Shading from cast and from nature; classic objects and furniture enlarged from copy; Designs finished with Pen, Brush and Distempera color; Architectural construction.

Design for Church Decoration in Historic Styles; Memorial Windows for stained glass; Decorative Designs commemorating events in History; History of manufactures, and important inventions.

ADVANCED TEACHERS' COURSE.

A teacher must be prepared for emergencies for which the professional designer or artist has no experience. A general knowledge of the several subjects is therefore recommended. The decorative and painting courses will be worked together so as to form a thorough course for teachers.

The authorities of the University have provided that persons not connected with the institution may join the drawing and painting classes on very moderate terms.

MUSIC.

Music constitutes no part of any University course of studies, and is therefore not provided by the Trustees. But as many students, especially young ladies, desire instruction in music, competent teachers are selected by the Trustees, and rooms set apart for instruction.

COURSE OF INSTRUCTION.

Bertini's Instructor; Clementi's Sonatines, Op. 36, 37, 38; Heller's Studies, Op. 36, Books 1 and 2; Duvernay's Studies, Books 1, 2, 3; Loschhorn's Klavier-Technik; Czerny's Etudes de la Velocite, Op. 299, Books 1, 2, 3, 4; Czerny's Fifty Finishing Studies, Op. 740, Books 1, 2, 3; Cramer's Studies, Books 1, 2, 3, 4; Mendelssohn's Lieder ohne Worte; Clementi's Gradus ad Parnassum.

TUITION.

Instruction term of ten weeks—two lessons a week	$10 00
For term of ten weeks—one lesson a week	6 00
Practice on piano, one hour daily, per term	2 00

TERMS.

Ten weeks—two lessons a week	$12 00
Ten weeks—one lesson a week	7 00

No deduction on account of absence in either course, except in case of protracted illness.

Special students in music will also be charged the regular term fee charged other students of the University.

UNIVERSITY DISCOURSES.

During the two years covered by this report there have been delivered a series of discourses in the University Chapel, on Sunday afternoons, by the distinguished clergymen named below, belonging to various denominations and residing at different places in Illinois and adjacent States. The students heartily avail themselves of the rare opportunity of hearing the leading Christian ministers of our part of the country, and the citizens of the locality attend in large numbers.

The expenses of the course for 1882-3 were generously defrayed by Mr. E. W. Blatchford, of Chicago, and for that of 1883-4, with similar liberality and kindness, by Mr. A. C. Burnham, of Champaign, Ill.

For 1882-3.

Oct. 15. Rev. H. McD. Scott,
Subject: Christ, the Carpenter.

Nov. 5. Rt. Rev. George F. Seymour, S. T. D.,
Subject: The Bible Portrait of the First Christians.

Nov. 26. Rev. H. D. Jenkins, D. D.,
Subject: Sobermindedness.

Dec. 17. Rev. L. P. Mercer,
Subject: The Christian Life.

Jan 21. Rev. George Batchelor,
Subject: Charity.

Feb. 11. Rev. J. H. Barrows, D. D.,
Subject: Man's Need of God.

March 4. Rt. Rev. Charles Edward Cheney, D. D.,
Subject: Does Christianity Cultivate Manliness.

March 25. Rev. T. M. Post, D. D.,
Subject: Thinking.

April 14. Rev. P. S. Henson, D. D.,
Subject: Christianity and Common Sense.

May 6. Rt. Rev. John F. Hurst, D. D.,
Subject: The Incalculable Importance of Little Things.

For 1883-4.

Oct. 7. Rev. W. X. Ninde, D. D.,
Subject: Perfection, the End of Christian Endeavor.

Oct. 28. Rev. Herrick Johnson, D. D.,
Subject: Truth's Cost, Worth and Betrayal.

Nov. 18. Rev. Wm. M. Lawrence, D. D.,
Subject: Real Power.

Dec. 9. Rt. Rev. Alexander Burgess, D. D.,
Subject: The Glory of the Church and the Loss of that Glory.

Jan. 27. Rev. E. C. Ray,
Subject: Christ Blessing the Nations.

Feb. 17. Rev. F. M. Bristol,
Subject: The Christian's Triple Motto.

March 9. Rev. H. M. Scudder, D. D.,
Subject: Christians the Light of the World.

March 30. Rev. F. A. Noble, D. D.,
Subject: Conversation.

April 20. Rt. Rev. Samuel Fallows, D. D.,
Subject: A Wheel in the Middle of a Wheel.

May 11. Rev. Galusha Anderson, D. D.,
Subject: Do We Ever Really Forget?

SPECIAL PAPERS.

The Duty of the State Towards its University:
By the Regent, Dr. S. H. Peabody.

Illinois: Its Present and Future Greatness:
By the Regent, Dr. S. H. Peabody.

Experiment in Silk Culture:
By Professor Burrill.

Parasitic Fungi of Illinois: the Uredineæ:
By Professor Burrill.

The Chemistry of the Hog;
By Professor McMurtrie.

THE DUTY OF THE STATE TOWARDS ITS UNIVERSITY.

By S. H. Peabody, LL.D., *Regent.*

Society is a natural and necessary organization of men for common protection and development. Man can scarcely live by himself, much less can he thrive and prosper alone. In childhood, and in old age, his incipient and his decaying powers require the fostering care of others stronger than himself. In the full glory of his mature years, before yet the gray hairs have become the symbol of waning life, he knows that his strength is but weakness, if it is to be exerted, not indeed as against all, but even in the absence of all. No being could be conceived in more abject misfortune than a man left alone on this round world to fight the wager of life's battle without comradeship, or human sympathy or aid.

Society has been described as the voluntary association of men for the accomplishment of certain purposes. In fact it is their necessary grouping, in larger or lesser circles, without which progress is impossible and existence is precarious. The individual has but feeble choice in this respect. If he withdraws from society he perishes. There is at least this difference between the suicide and the hermit, that the latter may yet return to the society whose fellowship he has spurned, and to take up again the duties and responsibilities which he had laid down. There was no healthful development, or even introspection in the seclusion which Henry Thoreau maintained when he left the busier haunts of men and consorted with the sparrows and bluejays, the squirrels and green snakes in the woods that were mirrored in the waters of the Walden pond. From that seclusion he was forced to emerge that he might tell the world what sort of solace the little cabin had granted to his solitary hours. So true it is that no man liveth, and no man dieth, to himself.

The instinct of self-preservation is at first the bond that binds men in groups, the family, the clan, the tribe, the nation. Without some cementing adhesion the granite boulder becomes a crumbling heap of sand. Without some bond of union, as of affection, or interest, or of provision for common safety, the group which had within it a force equal to the demands of the most exacting emergencies, is resolved into a mob of persons powerless even against each other.

That which is true of persons is equally true of groups, larger or less. In the days when our fathers talked of resisting the encroachments of a British ministry, a so-called incendiary design was circulated widely, showing a serpent divided into thirteen portions, each bearing the name of a colony and all surmounted by the motto, "Unite or Die!" Later the preamble of the constitution of the United States recites that the people did ordain and establish that constitution in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and, by so doing, secure the blessings of liberty to themselves and their posterity. Evidently the founders of this government here assert the right to do whatever may be needful to secure domestic tranquillity, the common defense, and the general welfare. If, then, the people might look to those who were drafting the organic law for the creation of a new and a glorious nation, for the formulation of such assertions of justice, and such bulwarks of liberty as are guaranteed in that remarkable document, with equal propriety may the people seek, and ought the government to supply such other immunities, privileges, and rights as may also appear to be bulwarks for the common defense,—both producers and conservators of the general welfare.

Let it not appear that we hasten by a bound to the extreme and dangerous dogma that the state shall, if it could be conceived possible, do all things for all men. The man is not to the state just what the crystal is to the boulder, or the fibre to the tree trunk, or the drop to the engrossing sea. There is all that, but there is more. There remains to him a certain personality, his individuality, which must not under any condition be destroyed or lost. The state may be *E pluribus unum*, the multitude inwrought in one; the man must remain *in pluribus unus*, amidst the multitude still distinct. That should be avoided which makes the man only the fragment in a vast machine. That should be afforded which by increasing the grand potency of the combined aggregate may increase the happiness or the usefulness of the segregated individuals.

It may not be easy to draw a sharply discriminating line between those things which the man should be left to do for himself, and those which the state should do for the general good. The man must ordinarily provide for his own sustenance and that of his family; must secure his own food and clothing and shelter. Yet in the stress of fire or famine, of pestilence or invasion, it may be imperative that the cost of even these things be furnished to him, at least temporarily, from the general coffers. The rule is, and ought to be, that the man shall cultivate his own farm, build his own mill, open his own mine, operate his own steam engine, sail his own ship. Each of these and other such enterprises he is strong enough, as the society is organized, to originate and carry forward by himself without the intervention of the aggregated force. Each of these will have a healthier growth, and a stabler prosperity, under the laws of production, and trade, and competition, than they could have in a more crystallized form. But the man can not adequately furnish security for himself and his family from the assassin and the thief; can not ensure the peaceful and permanent possession of what he has accumulated, and the state must defend his rights in these particu-

lars, must protect him in the enjoyment of life, liberty, and the pursuit of happiness. So too, because the people of a country need the power of the most perfect organization in any conflict with a foreign foe, the state must perfect this organization, and wield and direct the thunderbolts which give security against invasions from without, or dissensions within.

The state in its aggregate and corporate capacity should provide for all those needs which the citizen in his individual and segregated, and therefore feeble, condition can not adequately provide for himself. For this reason, and for this alone, it is that the state should insure justice, defend the innocent, and punish those who violate public peace; and to this end must maintain courts and all their paraphernalia of jails and court houses and prisons. For this reason, the state at the public charge will care for the disabled in hospitals, and for the unfortunate, the insane, the blind, in almshouses and in asylums.

The state should not ordinarily build the ship, or furnish the tug or the pilot to move and guide the vessel to its moorings or out upon the high seas; it should furnish an accurate chart on which are shown the contour of the shores, the places of danger, and the safe channels that lead to the secure haven; it should mark these watery highways with beacons and buoys, and light the headlands and the dangerous shoals, and if in stress of storm the vessel be stranded before the howling terrors of a lee shore, just there the state should be present in the persons of its hardy servants, to afford the timely service of its life-saving appliances. These provisions will be of supremest need at the critical moment, coming often without premonition or preparation. That instant may never intrude its unwelcome presence during the entire life of many a fortunate seaman, yet may come to the experience of every one. If provided at all this help must be provided by a broad and encircling forethought, surveying a wide territory, arranged by peculiar wisdom, guided by long experience. Only combined wisdom, wealth, and watchfulness can do that which must be done. The state alone can organize the forces by which this most necessary and humane duty may be performed.

Other instances of this duty of the state towards its citizens have long been recognized. No other satisfactory reason can be given for the defense of that policy which taxes every citizen in the purchase of the most common articles, that manufactures may be planted in their infancy, and supported sometimes after they have reached a stalwart and sturdy manhood. The whole theory of protection assumes that the state as a unit, in its corporate capacity, has an interest in such additions to the kinds and extents of its manufactures as will secure independence upon other states in respect to any of its necessities, and as will develop its own resources, natural or acquired. The state says to the individual: If you will develop a new industry you shall be protected in the profits of that industry; if you will introduce one known elsewhere, every citizen shall pay a higher price for the product of that industry until you yourself shall break down the market by producing more than the public requires. To the extravagant applications of these principles many object; in their proper and legitimate results, all acquiesce.

The great river which drains the very region where we dwell, winds its meandering course to the sea in utter disregard of the interests of those who dwell within sight of its angry currents. In the fullness of its swollen floods it sweeps away entire farms on either bank, spreads devastation over many leagues once occupied by smiling homesteads, and bears to destruction lives and wealth, with all the accumulations of the toiling years. Men, hamlets, towns, cities, can not cope successfully with this insidious and remorseless enemy. Combined force alone, directed by the highest intelligence, can presume to control this reckless river, if indeed, control be the wise and prudent course to undertake. The indolence, or the stupidity, or the malevolence of a single person may hinder, or may destroy, the success which might follow the most skillful plans and the most efficient execution. Society, in its organized capacity, which means the state, must undertake the control of this stream, and must perform it in such a way as shall secure the greatest good of the greatest number.

It is said in regard to projected improvements of the Mississippi river, that the state is interested only so far as the navigation of the stream is concerned. That is, that the shores of Tennessee and of Arkansas should be protected from the encroachments of the river, in order that the steamers of New Orleans and St. Louis may float between these shores in safety; that, as was once thundered from every rostrum in the north, when the war bugles were sounding the call to arms, that the products of the north might have an unrestricted outlet to the sea. Looking, however, at individual interests, one may be puzzled to explain why the tens of thousands who navigate the stream are more worthy of consideration than the hundreds of thousands who till the soil along its banks. Both are alike citizen-atoms of the great unit; both help to swell the aggregate of population, and wealth, and production, and national prosperity, and each have equal claims to the fostering and protecting care of the nation.

Thus, in a multitude of examples, the greatest good of the greatest number, is secured only when the accumulated power of the greatest number becomes the agent by which the greatest good can be wrought. If this be not the reason, what right has society to intermeddle at all with the business, or the pleasure, the labor or the profit of any person? Why should he not remain, in all things, self-dependent, as self-reliant, to struggle as he best can against the forces of nature, and of life, to vegetate, perish, and decay?

The difference between the dwellers by the Thames and Seine, and the rude savage who paddles his canoe upon the Congo or the Orinoco, lies not alone in the nobler grade of intelligence which characterizes the former. This great difference is partly the cause, and partly the consequence, of the reacting forces of combination, concentration, and aggregation, that the nobler intelligence can evoke and control. Remove this power from the possibilities of the conditions, and the proud Englishman, the versatile Frenchman, would be dropped many grades down the scale towards the state of the aboriginal savage.

What are the obligations of the state to education? What aid should the state furnish? How can its duties be best discharged?

Everywhere among the civilized communities of the world education is most advanced, its completeness is most notable, its benefits most pronounced, where it has been the foster child of the state. Wherever the combined powers of the state have been evoked, and the directive control of the state has become the guiding authority, so that the whole people have been brought under its influence, there the state has in return been made the most wealthy, the most powerful, the most noble. And this, moreover, has been found to be true; that these results have followed with certainty and completeness, only when the education has been of such a nature that it should permeate and pervade the entire body politic from its highest to its humblest grades. Germany began to lead in the race for supremacy in the affairs of Europe, that dominant place which England once enjoyed, when Germany began to give to all her children the opportunities for the highest culture. Say what you will of surpassing numbers and superior wealth, as the forces which won the victory for the North over the South in the great struggle of twenty years ago, the fact remains that for generations previous to that conflict the schoolmaster had been abroad in the North, and had been conspicuously absent from the South. The results of an education, not of the highest and noblest, but most widely diffused, had fostered the spirit of freedom, had secured general intelligence, had encouraged enterprise, and had made wealth a common inheritance throughout the North. The lack of these same educating influences in the South had pandered to slavery, had steeped the masses in ignorance, had disheartened enterprise, had concentrated wealth in the hands of a few thousands who in their commanding social position could hold the remaining millions in the thick darkness, either of slavery or of equally abject and ignorant poverty.

With confidence I assert that but for the peaceful victories which had been won by the schoolmasters of the North, the victory of freedom which culminated beneath the apple-tree of the Appomattox had never been celebrated.

I desire in my humble way to emphasize this assertion, which I most conscientiously and sincerely believe—namely that the general almost universal, common school education of the North, reaching upward by constant and regular gradations to the highest and noblest culture, was the one underlying and most efficient cause of the victory won for freedom in our deadly conflict with the South. No man who knew the stuff of which the two armies were composed could fail to observe the grand superiority which was shown by the more intelligent boys from the Northern schools. Witness the old Sixth Massachusetts, out from whose ranks could be chosen a man for any emergency, and for every conceivable duty. They say that about Baltimore a disabled locomotive was found, and there was a call for machinists to put the engine again in order. As one stepped to the front the question was asked, "Do you know how to put this machine to rights and to run it?" "I guess so," was the response. "I helped build her." Witness the Normal Regiment of Illinois, the Iron Brigade of Wisconsin—but why stop to enumerate? The only parallel to the Northern army in our late war, was the German host which put on its spectacles and captured France as one wins a game upon the chess-board.

I say that I desire to emphasize the assertion which I have made because there seems to be growing in many quarters a certain antagonism to popular education, except of the very lowest grade, which seems to my mind peculiarly in error, and like all such errors, especially mischievous. It is that in these days we are educating the common people too much, and out of their proper sphere. Who are the common people? Why, the farmers and the laborers and the artizans. What, indeed, is their peculiar and proper sphere? Why, forsooth to dig, and delve, and toil, at low wages, and with scanty comforts, and therewith to be content. Why is that their sphere? Why should they be therein content rather than thou or I, O man, who hast perhaps escaped from that peculiar form of toil and trial into another not less burdensome and more care-laden, but of higher supposed respectability? What reason that your son and your daughters should have sound instruction and thorough discipline, with every facility that the inventive brain of these later days can devise? Why, you say, that the child may get on in the world. That he may achieve success, accomplishment, culture, comfort, wealth, position, influence. All this is right and just for you and yours. But why should not the child of humblest parentage, heir of the self-same heritage, child of the self-same God, have the chance as well as your child to win these rewards of earnest and honest industry and toil, patience and application. Time was, indeed, and that not long since, when the possible progress of the child of humblest birth to positions of highest responsibility and honor was held to be one of the crowning glories of the freedom which our simple republican government especially fostered. Twice within the memory of most who listen to my words, has the nation mourned its sudden and sad bereavement when its loved and honored president was stricken by the bullet of an assassin. As the multitudinous processions marched with slow and solemn tread to the muffled beating of funereal drums, the great heart of the nation throbbed with sobbing pulses, in fullest sympathy, because the people—the common people—even the unlettered and the lowly, remembered that each of these murdered patriots had sprung from their midst; that the dead were of their blood and bone and sinew, who had proved in their own experience the possibilities which were not barred against any free born lad.

The fact is that all this talk about educating people out of their proper spheres, filling them with aspirations and longings that render them forever miserable, and forever useless in their yearnings for something never intended for them, is but the cant of caste—than which no form of cant is more distasteful to him who really loves his fellowmen.

It is urged that boys now-a-days are unwilling to work, and that therefore they seek employment at such sinecures as fall to cash-boys, clerks and writers. I do not admit or believe that the boys are too lazy to work. For three reasons they can not get the work they could have had thirty years ago:

1. The introduction of machinery has removed from their reach most of the simpler forms of labor that boys then performed.

2. The importation of foreign labor has monopolized most of the forms of labor which yet remain.

3. The despotism of the trades unions in all the large towns has forbidden the employment of boys in most of the remunerative trades.

Between these three there is beside agriculture little recourse left but the counting-house or the street. It has often happened to me to advise parents whose boys had come to the wayward stage that often intervenes between youth and manhood, that their boys should be withdrawn awhile from study, and set at regular, wholesome, daily toil. And with a mournful regularity the answer has followed, "I would gladly take your advice, and the boy would willingly go to work, but there is no work that I can find for him to do." And I was silenced, for I knew the answer to be true.

It is one of the nobler qualities of our American youth that they have aspirations; that they seek higher planes of character, intelligence and influence, with earnest hopes for all those possessions which mankind unite in thinking valuable. If one would dwell in a land where for generations men have been trained to be content, to think that their little lives are sounded only by a sleep, and to be spent only in the occupations of their ancestors, transmitted from father to son, let him migrate to Japan.

There seems to be little question that the interests of primary education should be cared for by the state, that is by society organized under the forms of law, rather than by private persons, either singly or associated. One after another the States of the Union have adopted general systems of public instruction, to provide the so-called rudiments of education for all children. When the newer States were carved out of the public domain, the acts of Congress which provided for their organization gave to each a considerable portion of the public lands. Before the admission of Kansas, each new State received for schools the sixteenth section in each township, or one thirty-sixth of all the land in the State. The younger States, beginning with Kansas, have had a double portion, like the Benjamin in Jacob's household. To these States the General Government has given for common schools two sections of land in each township, or one eighteenth of the whole domain. The elder States have in various ways acquired large funded endowments, whose incomes are devoted to the same purposes. These sources of revenue being still inadequate to meet the expenses of the schools, the residue has been raised by taxation more or less direct. At present no one of the States of the Union which has not made provision for this laudable purpose.

The reasons why the public should carry this work forward, as usually given, are:

1. The general welfare requires that all members of a self-governing community should be lifted out of a condition of illiteracy. A people which includes a considerable share of ignorant inhabitants includes in the same ratio a share of unreliable, mischievous, and dangerous persons.

2. This duty, this involving a very necessary element of self-protection, can not be performed in any other way so certainly or

so economically as it can be performed by the state. On this basis it becomes the sure inheritage of every American child; a portion of his birthright, inalienable in estate, inestimable in value.

Even in lands where this grade of instruction is not, as with us, absolutely free, the principle is yet recognized that it is the prerogative of the state to direct and to control the education of its children. In France, and in Germany, the chief officer of the department of education is a cabinet minister, like the chief of the departments of finance, or law, or diplomacy. The interests are so vast, the consequences so important, the details of such intricacy, that no power less than the highest can control, and no authority less than that of the government can be entrusted with their management.

In this respect there is great room for improvement in the administration of our own public school systems.

In the year ending June 30, 1880, the State of Illinois expended on her primary school system $7,531,941.79, of which $4,587,015.10 were paid for teachers' wages, and distributed to an army of 22,255 persons, for the instruction of 704,041 pupils. The total number of persons of school age in the State was 1,010,851, 75 per cent. of whom were enrolled in the schools during the year, while it will be safe to assume that the larger part of the remainder have passed through their school experience and are occupied in labor.

In the United States the number of pupils in the public schools in 1880 were 9,333,576; of teachers, 261,786; and the expenditure, $92,748,974.

The aggregates show the enormous extent of our school system, and illustrate the statement that such an enterprise would not and could not be operated by any feebler machinery. On the other hand, it is well known to every one who is at all conversant with this school work, in its multifarious forms, that the outcome of all this toil and cost is far less valuable than it might be made. The State does not reap from this broadcast sowing the harvest that it might reasonably expect. It is indeed a marvel that the harvest is as good as it is. The results are matters of constant surprise to every well-informed educator, when he scans this army of more than a quarter of a million of school teachers, and knows how large a proportion of them might well be superseded by persons of greater ability and intelligence, and when he reflects upon the great losses which follow the plentiful lack of system and of supervision which too frequently exists. Encouraged and hopeful at the great good that is done, one has yet reason to lament that the grander possibilities are not achieved which could be secured under a wiser, abler and more systematic control.

Whatever criticisms may arise upon the way in which the duties of public instruction are discharged, it still remains for my argument that this duty is by common consent delegated to the public authorities as one of the most important parts of their official duties.

In an address presented to this same body on a former occasion, I attempted to show the great interest of the state in the development of higher technical education. From the history of some of

the more notable nations of Europe, the lesson was drawn that material and commercial prosperity had been developed, and wealth and power increased by those nations, only as they had fostered the sciences, and promoted their application in the practical arts and industries. I recalled to mind the abundant resources of this favored land, rich notably in every natural condition for production of value of whatever kind, requiring only energy and intelligence for its development. The state has great uses for wide and thorough technical training for the development of all these material interests; that her farmers may know better the secrets of nature, potent in seed time, and while the harvests ripen in the field; that her workmen may curb the powers of nature to become their willing servitors, to will and to do according to their good pleasure; that her seamen may track the watery wastes in safety; that her miners may win the rich treasures that in the ages of a past eternity were hidden for them in the caverns of the earth; that her engineers may cast up highways and make straight the paths for traffic from the center of the continent to the remotest circumference; that all men and all women in city, forest or prairie, in palace or in cottage, may have longer life, better health, serener comforts, happier homes and nobler aspirations.

Now every man who can appreciate the full significance of these things has also the farther insight which knows that, magnificent as they are, and fully worth all effort and thought, praise and self-denial, they are yet of matter, material—I had almost said of the earth, earthy. There is yet another element in mankind. There is that spiritual essence that can know all these materials, and their conditions; that can discern their intricate relations; that can wield, guide and control them all, and still stand triumphant over all, their master and their ruler. In this significant but simple fact, that mind is dominant over matter, do we recognize the grander eminence of the intellectual powers of man, those active forces which in the life that is, control and govern all that come within the sphere of their action. Now the greatest nation of to-day is not that which possesses the greatest aggregate of material wealth before suggested, but that which shows on the one hand in the broad intelligence of its people, and on the other in the number and eminence of its more notable men the best and highest development of mind and character.

What constitutes a state?
Not high raised battlements or labored mound,
High wall or moated gate.
Not cities proud, with spires and turrets crowned,
Not bays and broad armed ports
Where, laughing at the storm, rich navies ride;
Not starred and spangled courts,
Where low-browed baseness waft perfume to pride.
No—Men,—high-minded men,
With powers as far above dull brutes endued
In forest, brake or den,
As beasts excel cold rocks and brambles rude—
These constitute a state!

What nobler product hath the state than her harvest of noble men? What pride more becomes the citizen of any land than the pride in the glorious names that illumine the pages of his country's history? What product of the century has been worth more to Germany, or France, or England than the brain of Bismarck, or Gambetta, or Gladstone? What richer inheritance has America than her long roll of patriots, statesmen, poets, philosophers, soldiers and scientists?

Now I shall not presume to say to you that any precise course of scholastic training will ensure such fruits. You can not produce a Gladstone as you erect a cathedral, or construct a Bismarck as you build and equip an ironclad. But they are the rare and precious products of the age in which they have lived. In them all the elements which characterize and condition the intellectual development of that age have culminated. Among these conditions and environments which have made such fruitage possible, the education and culture have been most important factors. In the admitted share which the higher seminaries of learning have had in the production of the great men who have in so many instances, not simply adorned the state, but have saved it from destruction and dissolution, is found an adequate compensation for all that such institutions have cost, and for their continued and generous support.

Again. The state should foster the higher institutions of learning, for the service they can give as providing the logical foundation on which the more general education of admitted value may be builded, and as furnishing the stimulus on which its healthy life will in largest measure depend. The state needs men of bright native parts, developed, polished and sharpened by the broadest and deepest culture, in every department of educated and professional labor. It has work for all and more than all to do. Much as the facilities for higher education have been multiplied during this century in this country, they have not kept pace with the advance of the population during the same time. President Eliot asserts that even in Massachusetts the ratio of students entering college to the whole population is not as high as it was fifty years since.

In 1879, the number of students enrolled in all universities and colleges in America was 56,181, or about eleven-hundredths of one per cent. of the whole population of the country. Naturally the ratio is found to be higher in the older and wealthier States, and falls as we approach the newer, less populous, and less wealthy frontier. Illinois can not be called a poor State, nor one on the border. She reported as college students seeking degrees an aggregate in the same year of 2,124 students in her 27 colleges. If we should add to that number one-third of itself, to account for sons of Illinois who were seeking instruction in other States, we should have a total of 2,832, or less than one-tenth of one per cent. of the population of the State, and 556 less than the quota to which the State would be entitled to by the average ratio of the Union. Of these 2,124 students, 289, or 13.4 per cent., were in the Industrial University; a number ninety larger than the number of actual college students reported in any other college in the State.

At present rates there is no danger that the number of collegiate students in this country will become disproportionately large. Numerous as the colleges seem to be when we look simply at the aggregate, they are not numerous as compared with the aggregate of population. The continual influx of immigration constantly lowers the ratios of educated men, since but few of those who seek our shores are persons of higher education. Were such an interest aroused in higher education as the circumstances require, all our college halls would be crowded to their utmost capacity.

I am not prepared to urge that all higher education—all education of the college, or the university, or the professional school, shall be under the control of the state or be supported at the public charge. I have no question that if this were a possible condition of things, the standards of education would be greatly improved, the work done with more concentration, and therefore at less aggregate cost, and that the results would be better suited to the needs of the country and more in proportion to the expense of treasure and of labor. But for very many reasons this condition of things can not obtain at present, and quite likely may never come.

But this proposition I would most earnestly maintain, viz.: that it is the duty of the state to make such provision that any earnest and determined youth may secure the best culture which the age can give, if he will faithfully do his part.

Society has a constant tendency to stratification. Everywhere the talk is of classes—higher classes, middle classes, lower classes, the wealthy, the poor, the ignorant, the learned. The planes of stratification are often fanciful, often absurd. With us, as we have no titled nobility, the destinctions lie most frequently in the different grades of wealth. There is an aristocracy of wealth, and each day the lines are drawn more closely and the wire fences are set with sharper and thicker barbs. In Europe these fences are built solidly and firmly—buttressed with ancient customs—fortified with laws of primogeniture and entail, and garnished with garters and fleeces, orders of the Bath, and golden crosses of the Legion of Honor. In Europe it is hard for a young man to find entrance into any stratum but that into which he was born. In our land the same condition of things is becoming more and more evident. The competition for position becomes fiercer every day. It goes a long way for a young man now that he has a friend behind him who may help him to gain a foot-hold upon the ladder. He who lacks that help too often lies like the impotent man who for so many years had seen others step before him into the pool and be healed. All this is foreign to the genius of our domestic system.

Now we confidently assert that the safest and the surest remedy for this condition of things is to be found in a wider and higher education. Armed with this trusty blade the man may hew his path through the wire fences; he may undermine and overturn even the walls of ancient stone, hoary with lichen. With the education comes a stirring up of strata, which serves more than the men who move. It helps to purify and improve society, as the tides and currents sweeten the sea.

Count the poor lads who from humblest obscurity found their way through a college course, and there learned the philosophy of labor, and self-denial, and perseverance, which carried them still onward and upward, until like Webster or Garfield they became the trusted leaders and the wise counsellors of the republic. The state needs precisely the men which this experience makes, and it needs to see that this experience does not become so bitter, and this trial so sharp that even the bravest and the noblest recoil from such effort.

This is the condition to which many of our colleges are coming, especially of those upon the Atlantic slope. Once the homes of students of scanty means but large brains, they contain a constantly growing number whose feebler brain power is compensated in part by an abundance of the precious metals, not omitting brass. The danger, a danger which I have long recognized as approaching, and which I earnestly hope may be averted, is that only the sons of wealth can pay the costs of going to college. On the contrary, I would make the conditions of higher education such that side by side with the children of the wealthy, the sons of toil may march steadily with equal pace and with equal grace, dignity and success, up the rugged road to learning's temple.

For this end I invoke the aid of the state. For this I ask a pittance, only a pittance of the public treasure.

I do not expect that every youth shall take a collegiate education. That were indeed utopean or worse. I do plead that any boy may have the chance to secure such a training. Let the state furnish the instruction, let the boy furnish himself. Let the course be a plain and direct one, through the primary, or district school, through the academy or high school, through the college or the university, up to such a platform that the student has acquired full development and good control of the powers which the creator has given him for an inheritance. Then will the state have made an addition to her vital prosperity which can not be weighed against tons of precious ore, or counted against myriads of fattened beeves.

This work can not be done so well as by the state. I recognize how much has been accomplished by individual effort, and by private munificence. Grand institutions are now in our land, founded and nurtured without state intervention, that are perennial fountains of intellectual life. And there have been colleges, planted by the state, but never fostered or nurtured after, whose lights have gone out in darkness, and whose only present endowment are the memories of a worthy record.

But the demands for larger facilities of education are now upon us. The young men and women of to-day can not wait until the Fields and the Leiters, the Goulds and the Vanderbilts have made all the wealth their desires can compass, and have developed in the evening of their lives a desire to become the patriots of learning.

The work is one of public necessity, for the public weal—"for the common welfare, to promote the general prosperity"—and the state should no more wait for the men of wealth to endow her colleges, than she should expect them to build her fortresses, or launch and equip her navy.

Has Illinois a special duty in this respect?

The State of Illinois was admitted to the Union in 1818. The act of Congress under which she was admitted gave to her 3 per cent. of the proceeds of the sales of public lands in her borders, one-sixth of which was to be devoted to the establishment and maintenance of a State College or University. From this source she received the sum of $156,613 22.

By the same act certain lands were donated for the founding and supporting of a State Seminary, from which source was received the sum of $59,838 72, and from both together the sum of $216,452.04.

There can be no question but that the purposes of the original grants were, one pair to endow a College or University for young men, and the other to endow a Seminary for young women, as the terms were then understood. It is also clearly apparent that from the day they were given to to-day, these funds have never been used as they were originally designed to be used.

Now do not let me be misunderstood. I have no words but those of kindness for the two Normal schools, which have been for years the beneficiaries receiving the income of these funds. I know their aims and their successes; their able corps of teachers, and the superior quality of their instruction. In my excursions to various points of the State, I continually see the proofs of their great usefulness, as distinctly marked as is the fertility which follows the yearly irrigations of the Nile before the gaze of the traveler in Egypt.

The common schools and the secondary schools all over Illinois are growing better, year by year, and decade by decade, by reason of the healthful influences which are pouring forth constantly from these institutions of learning. The state can not afford to dispense with them. The state needs the help of more such schools. If we take four years as the average time of service of a teacher,—which, I think, will be found to be over the mark,—we shall find that 5,564 new teachers are needed annually—a number more than twice the aggregate in all the normal schools and colleges in Illinois.

Nor would I suggest that the funds which have been heretofore given for the support of the Normal Schools be taken from them. The money yields an abundant and constant return. But the State of Illinois having used for many years the income of the funds referred to, for no purpose whatever of higher education, and for many other years for a purpose intrinsically valuable, but still not that designed when the funds were given, she ought in equity and justice towards herself, her children, and the general government, whose almoner she has undertaken to be, to provide other and adequate funds for the only institution in her borders which can claim to be a State University, doing the higher grades of work contemplated as well by the act of 1818 as by that of 1862.

Were this a question between man and man, to be settled as such cases are settled, by appeal to justice and equity as administered in the courts, there could be no doubt as to the decision. But while the State can not be reached by such methods of procedure, her duty is not the less clear.

Let us, however, put this matter upon an entirely broader and higher basis. Let us be a party to no petty wrangling about the sums referred to. If there were no such moneys in the State treasury, still the duty of the grand State of Illinois would be to support a State University which should be worthy of the name, and an honor to the Empire State of the Mississippi Valley.

If Illinois were small in area; if her population were sparse and poor; if her native resources were meager; if she had been seared and scarred by war, and afterward plundered by thieves; if she had seen a vast amount of the property which she had been trained to believe her own, vanish as at the lightning's flash; if, in short, she were in the plight of some of her Southern sisters in the galaxy of States, one might pardon her for seeking to avoid every possible burden.

But what is Illinois? What does she possess!

I can not attempt to answer fully—but a few items will suggest still more. She had a population, in 1880, of 3,077,871, which made her the fourth State in the Union, in that respect, and surpassed only by New York, Pennsylvania and Ohio.

She has a territory of 55,405 square miles, equal to 35,459,200 acres. Of this land 31,673,645 acres are included in farms, and 26,115,154 acres were improved, leaving 5,558,491 acres yet to be improved. The number of acres of improved land in 1870, were 10,329,952, so that the number of acres brought into subjection during the last decade was 15,785,202. The value of the farms as reported in 1880 was 1,039,594,580 dollars, and the aggregate wealth of the State is not less than 2,000 millions of dollars.

The farm products of 1879 were as follows:

Acres of corn	9,019,381	Bushels of corn	325,792,481
Acres of wheat	3,218,542	Bushels of wheat	51,110,502
Acres of other grain	2,223,741	Bushels of oats	63,189,200
		Other grain	4,530,167
Total acres in grain	14,461,664	Total bushels grain	444,622,350

Number of horses and mules	1,146,360
" cattle	2,484,322
" sheep	1,037,073
" swine	5,170,266
Total of farm animals	9,848,021

The aggregates expressed by these figures are too great for our apprehension.

If the farmers of Illinois would permit the University to choose one fair ear of corn, or its equivalent, from each acre of land in corn or grain in the State, the proceeds would more than twice pay the present annual expense of this institution. If the State would collect and pay annually into the treasury 1-100 of one per cent. of the cash value of the property of the State, this University would need no other endowment; and might safely rely on the natural in-

crease of wealth for its future constant and healthy growth. The sum realized from such a levy would be about six times as much as the institution now asks of the Legislature; the rate would be about one-third of the tax which Michigan raises annually for a similar purpose.

The conclusions to which I would lead your thoughts are these:

1. The State ought to furnish an avenue by which any youth within its borders may find his way to the best education which the advancement of human knowledge can give, and which the progress of human civilization can apply towards its farther development.

I do not say that this should be entirely free of cost, but it should be at such a cost that any really earnest and active person may secure its benefits.

The fundamental items of outlay are necessarily so broad and so large, while the diffusion of the benefits is so general, that the whole subject becomes practicable in its best and completest form, only when the enterprise is ordered, and controlled, and supported by the State.

2. The State of Illinois is in honor bound, by reason of its acceptance of the bounties of the United States government, given it in the acts of 1818 and 1862, to maintain at least one institution of learning of the highest character, scientific and literary, practical and useful in any sphere.

This she has never adequately done up to the present day.

3. The provision which this State has made, with the assistance of the communities of Champaign and Urbana, and of the county of Champaign, have been wisely and carefully husbanded and applied in the erection of buildings, their provision in the appliances necessary in educational work, in the establishment of workshops and laboratories, libraries and museums, observatories, farm equipments, and other items too many to be now enumerated—and there is here planted a vigorous and healthful tree whose growth has been continuous, and should be gratifying to those who know at what cost of money, and time, and brain, and patience, and undying hope such enterprises succeed if they succeed at all.

This foundation, well and firmly laid, is broad enough and deep enough for the most perfectly organized and complete superstructure. Upon this foundation, from motives of economy, in making most useful the expenses already incurred—from motives of philanthropy, in providing for one of the most necessary wants of a great and growing State—from motives of honesty in carrying out to the full the solemn contracts entered into—from motives of honorable and worthy State pride, in that it ought not to be outdone in any noble undertaking by her sisters who sit by her border, and, with less ability, have thus far shown grander results in this direction—from motives of true patriotism, in that the noblest preeminence of the State is secured only by the highest attainments and the grandest developments of her citizens; from every impulse of lofty aim and high purpose—on this foundation the State should construct the University of the State of Illinois. It should so foster its growth

and assist its usefulness that even within the lifetimes of those who are to-day students within its walls, it may come to emulate the foremost schools of higher learning that exist on this or any other continent—whether Harvard or Yale, Oxford or Paris, Halle or Berlin.

But here I meet the fear of those who dread the possible competition of scientific when pitted against classical learning. I insist first that no unfriendly competition need exist. That there is no reason here, more than in Europe, why these two streams of learning, the ancient and the modern, the old with its useful conservatism, the new with its earnest vitality, may not flow on equably in one channel. The experiment is not new. The "sense for culture" and the "sense for conduct" may both have their full development. They who drink at this fountain may find their scientific attainments brought into better relief, and be made more precious to themselves and more useful to the world by the amenities and the graces of those other high types of scholarship. They may find their classical culture vitalized, strengthened, made of more immediate daily practical use, by the infusion of the forces of all scientific training. Each may be benefited by the help of the other.

If it were true that the classical could override the scientific—if, as some assert, the classical spirit is in deadly hostility to scientific vigor, the scientific life could not succumb unless it were indeed the weaker, and the law of the survival of the fittest might here find occasion for its application. But I do not believe it. The scientific basis here laid, the progress of development here secured, has already acquired too much strength to be injured or killed in any such way.

Finally, that which ought to be is that which will come, sooner or later. If the thoughts which I have presented are sound, and right, they will be found, here and elsewhere in the State, taking root, springing up, growing, spreading, and in good time ripening into action.

If they are yet too early for this soil and this climate, not yet adapted for these environments, though they may not now fructify, the years will come when the people of Illinois will build in their midst, here or elsewhere, by the people, for the people, open to all the people, a stately symmetrical and most grandly useful

University of Illinois.

When that time comes, even if an hundred years have elapsed, and all of you and I sleep beneath the green billows of the prairie —then will it be found that the seed, even of this humble sowing, shall not have utterly faded from the earth.

ILLINOIS, ITS PRESENT AND FUTURE GREATNESS.

By S. H. Peabody, LL. D., *Regent.*

Illinois stretches from Cairo, in latitude 36 deg. 56 min., to the southern border of Wisconsin, in latitude 42 deg. 30 min., a distance of about five and one-half degrees, or 389 miles. Its greatest breadth is about four degrees of longitude, or 212 miles. Its northern limit has about the latitude of Boston; its southern that of Norfolk, Virginia; so does it stretch from "lands of snow to lands of sun."

Its area is 56,000 square miles, or 35,459,000 acres, an area larger than the combined areas of Maine, New Hampshire, Vermont and Massachusetts; or of New York with New Jersey; or of Pennsylvania increased by Maryland and Delaware. The combined area of England and Wales is but 58,319 square miles. Italy has not quite twice the area of Illinois; France and Spain have each less than four times its area. No State east of the Mississippi River has a larger extent of territory except Michigan and Georgia, and their excess is small.

Illinois became one of the United States in 1818. Her population in 1820 was a little less than her number of square miles. Until 1850 her progress was comparatively slow. Railways were few. Settlements were made chiefly along the water courses. The grand prairie which occupied so much of the central portion of the State was thought to be unfit for habitation. There was plentiful lack of fuel above ground, and little knowledge of the stores of coal which exist beneath the surface, easily mined and cheaply transported.

Since 1850 the progress of Illinois has been that of a sturdy giant. Her population has increased nearly four-fold.

1850	1860	1870	1880
851,870	1,711,951	2,589,891	3,077,861

At the last census she stands fourth in the Union, surpassed only by New York, Pennsylvania, and Ohio, the latter by only 120,000 souls. Her development in material resources and in wealth has been as notable as in population. The totals of acres of land included in farms has varied thus:

1850	1860	1870	1880
12,037,422	20,911,989	25,882,816	31,673,645

It will be remembered that the whole acreage of the State is 35,459,000; thus there remain but 3,785,000 acres for space occupied by streams, railways, and village and city plats. Of the land in farms, the improved lands have aggregated thus:

1850	1860	1870	1880
5,039,545	13,096,374	19,329,952	26,115,154
42%	62%	74%	82.5%

This percentage of improved acres to total acres in farms is larger than for any other State in the Union. Iowa stands next, New York third, and Ohio fourth. No better index can be found of the universally tillable character of the soil of the State.

The number of farms in the State has increased thus:

1850	1860	1870	1880
76,208	143,310	202,403	255,741

The ratio of population to the number of farms has been in

1850	1860	1870	1880
11	12	12.5	12

This would seem to show that the ratio of farms to the total population of the State remains very stationary. It appears that there is in the United States a constant movement of people from the country, and a concentration in towns, as shown by these ratios or percents of people in towns of 4,000 and upward, as compared with the whole population:

1850	1860	1870	1880
12.5	16.1	20.9	22.5

These ratios hold in Illinois. A comparison of the two series of figures indicates to my mind that the farmers are still upon their farms; but that all mechanics, tradespeople, men of professions, etc., as might be expected, are in towns.

The number of dwellings in the State, of families in each, of families, and of their members, are as follows:

	1850	1860	1870	1880
Dwellings	146,544	304,123	464,114	538,221
Occupants in each	5.81	5.62	5.47	5.72
Families	149,153	315,539	474,533	591,934
Members in each	5.71	5.43	5.85	5.20
Size of farms—acres	158	148	128	124

The aggregate cash value of farms has increased in thirty years more than tenfold, thus:

	1850	1860	1870	1880
	$96,133,290	$408,944,033	$920,506,346	$1,009,594,580
In percents		326%	125%	10%

In value of farms Illinois is surpassed only by New York and Ohio.

We pass now to a review of the increase of the agricultural products of the State as made in the last thirty years, thus:

	1850	1860	1870	1880
Barley, bu	110,795	1,336,338	2,480,000	1,229,528
Buckwheat, bu	184,504	324,117	168,862	178,859
Indian Corn, bu	57,646,984	115,174,777	129,921,895	325,792,481
Oats, bu	10,087,241	15,220,029	42,780,851	63,189,200
Rye, bu	83,364	951,281	2,456,578	3,121,785
Wheat, bu	9,414,575	23,837,023	30,128,405	51,110,522
Total bushels	77,587,463	156,863,565	207,936,491	444,622,350

The latter quantity of grain, if massed in one place, would cover a township of land ten feet deep; or if piled upon a base one hundred feet square would tower into the sky more than ten miles.

In quantity of barley raised Illinois stands eighth; in Indian corn, first by more than 100,000,000 bushels; Iowa next. In oats, first, Iowa second, New York third. In rye, second, Pennsylvania first. In wheat, first, Indiana second, Ohio third. In total grain, unquestionably and largely first.

Other farm products have been thus:

	1850	1860	1870	1880
Wool, pounds	2,150,113	1,989,567	5,739,249	6,093,006
Tobacco, pounds	821,394	6,885,262	5,219,724	3,935,825
Potatoes, bu	2,514,861	5,540,390	10,944,790	10,365,707
Hay, tons	601,952	1,774,554	2,747,339	3,280,319

In wool Ohio excels, with 25 million pounds; tobacco, Kentucky, with 171 million pounds; potatoes, New York, with 33 million bushels; hay, Iowa, with 3,600,000 tons.

The products of live stock are thus:

	1850	1860	1870	1880
Horses	267,653	563,736	853,738	1,023,032
Mules and asses	10,573	38,539	85,075	123,278
Totals	278,226	602,275	938,813	1,146,360
Working oxen	76,156	90,380	19,766	3,346
Milch cows	294,671	522,634	640,321	865,913
Other cattle	541,209	960,799	1,055,499	1,515,499
Totals, cattle	812,036	1,583,813	1,715,586	2,834,758
Sheep	894,043	769,135	1,568,286	1,037,073
Swine	1,915,907	2,502,308	2,703,343	5,170,266
Total live stock	3,900,212	4,547,531	6,926,018	9,738,457
Total value	$24,209,508	$72,501,225	$149,756,698	$132,437,762
Value farm impl's	6,405,561	17,235,472	34,576,587	33,736,951

In number of horses, Illinois stands first, Iowa second; milch cows, Illinois second, New York first; other cattle, Illinois third, Texas first, Iowa second; swine, Illinois second, Iowa first; total value of live stock, Illinois first, Iowa second.

The value of all farm products consumed, sold, or on hand, for 1879, was $203,980,137, higher by $25,000,000 than those of any other State, New York coming next.

Turning now to the manufacturing industries of the State, it will certainly surprise one who has not given special attention to this subject, to find that Illinois stands fourth in the list of States, both

in the amount of capital invested and in the aggregate value of the productions. Her progress has been as notable in this respect as in agriculture. Here are the figures:

	1850	1860	1870	1880
No. of establishm'ts,	3,162	4,268	12,597	14,549
Capital	$6,217,765	$27,548,568	$94,368,057	$140,652,066
Persons employed.	11,559	22,968	82,979	144,727
Wages paid	$3,204,336	$7,637,921	$31,100,244	$57,429,085
Material used	8,959,327	35,558,782	127,600,027	289,843,907
Value of products	16,534,272	57,580,886	205,620,672	414,864,873
Produced value	7,474,045	22,022,104	78,020,645	125,020,766
Share of labor.	20%	13.5%	15%	14%
Share of material	55%	62%	62%	70%
Share of capital	25%	24.5%	23%	16%
Profit on capital	70%	52%	50%	48%

In the estimate of shares we take the total value of the product as the unit; we set aside the cost of the materials used, and the amount paid for labor; the remainder is that which may be returned to capital, for rent, interest, and profit. The relatively increased share of materials may be taken to indicate in part, progress in the kinds of manufactures carried on. The product of the earlier stage of manufacturing may become the material of a later stage, as the leather of the tanner becomes the stock of the shoemaker. It may also indicate that closer competition causes a smaller margin of produced value to be divided between capital and labor. It may also show that the constant introduction of machinery and of improved process increases the relative amount of product and cheapens its relative value.

A comparison of the rates of division of the produced value between labor and capital for the several periods stands thus, produced value being the unit:

	1850	1860	1870	1880
Share of labor	44%	35.5%	39.5%	46.6%
Share of capital	56%	64.5%	60.5%	53.4%

I have neither the time nor the disposition to discuss here the vexed question, the indeterminable problem, whether labor has or has not its rightful share of the value which it helps to produce. I note simply the fact that in 1880 the share of labor was higher than at any time before in three decades, and that it has been steadily on the increase; while the profits of capital, whether as related to labor, or to the volume of production, or to the amount of capital employed, has been as steadily decreasing. I have not had time to investigate these items as related to the industries of the whole country, but it can not be presumed that Illinois should present conditions materially different from those which generally prevail.

The mining industry of the State, though important, does not present so large an aggregate as related to the other industries as might be supposed. The product of all mines and quarries is as follows:

Coal, tons	6,089,514	
Value of coal	$8,739,755	
Value of all minerals	8,911,279	
Value from quarries	1,342,572	
Total value out of earth		$10,253,851

The three great industries, Agriculture, Manufactures, and Mining, may be deemed to include nearly all of the productive labor of the State. I shall not, of course, assume that they are all that lend value to products. The influence of the labor employed in trade and transportation, in personal and professional service, including education, upon the aggregate of values is too subtle to be followed, and estimated, and set down in figures. Much of this influence has already been included in the figures given. Nor is it easy to present the aggregate of the annual production in the industries named. The aggregate value of all farm products for the year ending June 1, 1880, including all sold, consumed, or then on hand, is put at $203,908,137. It is not stated whether this is to include live stock or not, but as the live stock is separately valued, and as a rough computation of the value of the three leading grains, corn, oats, and wheat, gives nearly that total, I must assume that live stock is not included. Let us add, then, a share of the live stock as belonging to the product of the year; this share can not be less than one-fourth, or $33,109,440.

To this may be added at least the average percentage of increased value of farms, as reported for the preceding ten years, or two per cent. We shall then have as the total proceeds from agriculture—

Farm products other than live stock	$203,980,187	
Live stock, one-fourth	33,109,440	
Improvements, two per cent	20,000,000	
Total agricultural		$257,281,568
" manufacturing		125,020,766
" mining, etc		10,253,851
Total product of all industries		$392,566,185

The number of persons in the State is:

Under ten years of age	808,656	
Over ten years of age	2,269,215	
		8,077,861

There were employed in

Agriculture	436,371	
Professional or personal service	229,467	
Manufactures	114,727	
Trade and transportation	128,372	
Miscellaneous forms of labor	60,843	
		999,780

Say one million workers. If we divide the total product of all industries by this total number of workers, we have an annual return of $392 for each laborer. If we go back and compute the average wages of the manufacturing workmen by dividing their total wages by their total number, we find that they received each $397 per year.

The total value of property of all forms is not found in the census returns. It would be interesting to know what results would have been attained by the machinery of the census which has given us the other conclusions cited. We can do no better than go to the assessment rolls of the State, as made by local assessors, and corrected by the State Board of Equalization, and multiplying their figures by three, their results are:

	Returned.	Actual.
Real estate	$575,441,053	$1,726,323,159
Personal property	211,175,341	633,526,023
Total	$786,616,394	$2,359,849,182

Very many other items might be added to this list, which would greatly increase the grand total of the reckoning of the material wealth of this noble State.

The railways were reported by the Railway Commissioners as having within our borders in 1882, 8,541 miles of roadway and 10,463 miles of track. The average cost per mile of these roads is given at $39,041, which would make the total cost of the railways in the State $333,449,000.

The total passengers carried in Illinois in the year reported was	16,902,000
The local freight	24,783,811
The total earnings in Illinois were	$56,396,287.58
The total operating expenses in Illinois were	$37,628,704.77

The number of public schools in the State, elementary and high, is given at	15,208
School buildings	11,880
Sittings	694,106
Expenditures	$7,536,682
Teachers	15,912
Pupils enrolled	704,041
Persons of lawful school age	943,658

In spite of all the opportunities for instruction, it appears that 132,426 white persons could not write, and that 88,519 of them were born in the State.

It would be interesting to collate the statistics of colleges, including all higher and professional schools; of churches and all benevolent organizations; of newspapers and periodicals; of public and private indebtedness; of defective, dependent and delinquent classes; of disease and mortality; of the manufacture and sale of malt and

spirituous liquors. In all these departments the results would be astonishing, in some startling in the extreme. Each would bring into bolder relief the multifarious resources, the enormous development, the grand achievements, in some respects the threatening dangers of this noble commonwealth, which may well be called the Empire State of the Mississippi Valley.

Turn we now our view forward. Such have been the developments of the last thirty years. What will be those of the next thirty years? What will be recorded in the census of 1910? The answers to these questions will involve something of estimate, something of conjecture, something of guess. Yet it seems wise, after mounting to this point of vantage, after scanning the road already passed, to look forward, to examine the future, and to at least attempt a judgment of what we may expect.

First, then, as to population. We shall not expect that the population will increase in the same rapid ratio that we have found in the thirty years last passed. The great attraction which brings new settlers into a new country, cheapness of land, no longer exists in this State. The second great wave, that which follows the opening of new railway systems, has also swept over the State, and its crests are even now breaking against the Rocky Mountain slopes, a thousand miles to the west of us. The rush has passed, and even Illinois itself has come to be a State from which the restless and uneasy, unsatisfied with their conditions, emigrate still farther and farther west.

Yet the great States east of us have had their constant and equable growth, and we may reasonably expect to keep pace with them. The drift, the set of the currents of emigration and settlement, like those of the waters of the great ocean, are matters of permanence, and become very certain bases of calculation. For the last three decades the increments of New York have been very regular; thus, 1850 to '60, 783,241; 1860-70, 702,115; 1870-80, 700,121. In Pennsylvania, for the same periods, 594,123; 615,638; 760,940. Ohio, 359,182; 335,749; 522,802. With slight exceptions, not very material, these increments show great regularity. I see no reason why a similar regularity may not be expected in Illinois. If we suppose the decennial increment will continue as in the last ten years, we may expect in 1910 a population of 4,600,000; if we should find constantly the same percentage, which is less probable, we shall have a population of about 5,300,000 souls. We may then expect, in round numbers, that five millions of people will make their homes here thirty years hence.

Shall we be crowded then? Scarcely. The peninsula of Italy, which we have found almost exactly twice as large as Illinois, yet with by no means twice its extent of arable land, or other means of support, had in 1871 a population of more than 26,000,000 of people, which would be two and a half times as numerous as that we have presumed to expect. England and Wales, with an area about equal to Illinois, had a population in 1871 of 22,712,266.

Next as to land values. The aggregate value of the farms of the State, including fences and buildings, has been quoted at one thousand millions of dollars. This will give an average price for

the land, based upon the total acreage, of $32 per acre; based upon the improved lands, of $36.50. Now New York has in her farms 23,780,754 acres, of which 25.5 per cent. is unimproved, which by this time in the history of agriculture in that State means not susceptible of improvement, or at least of cultivation. The improved lands are, therefore, 17,835,566 acres. The total value of these farms is put at one thousand and fifty-six millions of dollars, which gives $59 per acre for the improved land. It will be objected that I leave the unimproved lands as worth nothing, which is substantially the fact in a great many instances. But if the value of the farms is divided among the total lands therein the price is still $45 per acre.

The total land in farms in Ohio is 24,529,226 acres, of which 26.6 per cent. is unimproved. The total value is given at $1,127,497,333; this will give $61.07 per acre for improved lands, or $46 for all lands in farms.

Now it will be remembered that in all the last thirty years the value in market of Illinois lands has been constantly depressed by the proximity of cheaper lands west of the Mississippi river. Why should a farmer pay ten to thirty dollars an acre for raw lands in Illinois, when land equally productive could be had at railroad prices or government prices, or without price under the homestead and forestry laws, 300 or 500 miles farther west? But the time for buying cheap lands has practically passed away. The wave of settlement has already overspread the largest part of the arable lands once offered for sale by the general government. Long before the next thirty years have ended, the United States will not have for sale a single acre of land which a farmer could afford to take as a gift, in comparison with Illinois land at $50 an acre.

The necessary effect of this will be to increase the price of fertile lands everywhere in the Mississippi Valley. Lands in Ohio and Illinois, Iowa and Nebraska, will necessarily become equalized in value so far as to make the difference depend chiefly upon relative distance from market, a difference which will be more and more removed by the competition of the railroads. Considering these facts, with also the small margin of unimprovable land which the Illinois farmer has to carry—in a large majority of the cases absolutely nothing—is it too much to expect that the lands of Illinois will before the end of the next thirty years, average within, say ten per cent. as much as those of Ohio, and by reason of their greater fertility, even more than those of New York? Is it unreasonable to believe that the average value of the lands of Illinois, throughout the State, will become $50 if not $60 per acre; that is to be advanced 60 or 80 per cent.? Is there any safer investment for farmers to leave to their sons than good farms, good education, and good common sense?

But will these lands yield a profit at this valuation? Does any one doubt it? Has any body fathomed the real productiveness of Illinois lands? or their staying qualities? Does any one suppose that the average corn crop of even the best years is a measure of what might be raised in the corn belt, when the lands are all reclaimed, and tiled, and skillfully and industriously cultivated? I

have heard the assertion that Illinois cattle breeders can not compete with those of Kansas and Nebraska, and of the plains farther west, on account of the cheapness of lands in those regions. The case is quite intelligible. A cattle feeder in Southern Nebraska will offer $100 and taxes, $64 more, for the use of 160 acres of land for a season, as a cattle range; that is twenty-five cents per acre. On this section of land he puts 320 head of cattle, thus feeding them through the grass season at a cost of fifty cents a head. If the same cattle were put on Illinois land at $30 per acre, the interest at 5 per cent. will amount to $1.50 per season, and the cost of feeding the same cattle will be $3.00 per head. But the fact is that the Nebraska cattle feeder will not long be able to hire cattle ranges at twenty-five cents per acre per season, and this inequality will be in a great measure destroyed. I see no reason why those farmers who follow the famous Illinois method of farming in a circle, whose four corners are land, corn, hogs, money, may not by the gradual but certain progress of values, by better culture of the land, including its more general and perfect drainage, and by the best skill in breeding and feeding the animals they raise, be able in less than thirty years to double the productiveness of their farms. Is it not possible that there is too much of the happy-go-lucky sort of farming even in Champaign county?

There is another source of added profits in farming which I expect to see worked as a rich placer mine during the next thirty years. I see the signs thereof in every cattle fair, under the direction of state or county societies, and in the great fat-stock shows held annually in Chicago. In the enumeration of the cattle in the state, we found the total to be 2,381,758 animals. I do not know what proportion of these animals have a strain of gentle blood in their veins; judging from those which the law makers of Champaign and Urbana permit to open my gates at any hour of the day or night, and to buck my evergreens to pieces, unless incontinently driven forth, I suppose that the cattle of the State are not of remarkably high grade or breeding. What per cent of increase in the aggregate value of the cattle of the State would be found, if every animal were not lower than say one-fourth, or one-half related to any of the breeds notable for producing either milk, or butter, or beef. Now I confidently expect that before the next thirty years it will be much more difficult to find an ill bred cow or steer, than it is now to find one thoroughly well bred, and that not from any sentiment or fashion, but because all farmers and others will have discovered that it will not pay to keep any other than good live stock. I expect that this principle will be found to apply as well to horses and sheep and swine, and that the 132 millions of dollars at which the value of the live stock is estimated in 1880 will become at least 250 millions in 1910.

Other sources of increased value to the state I expect to see in a more diversified husbandry; in a more intense cultivation; in a more skillful adaptation of means to ends; in farming which tills fewer acres, and yet wins larger harvests, in a more thorough and well devised drainage, in such a modification of law and of practice as shall prevent cattle from running at large, with a great saving in the capital now required to fence against them, which now absorbs

six millions of dollars annually from the profits of the farm. I look to see better farm machinery, and to see it better cared for. I expect to see a farmer leave his best bed in the mowing field sooner than to allow his mower to rust there until the next haying season. I expect to see by each barn a spacious shed for wagons, and the wagons sheltered there from sun and rain when not in use. I look to see each farm wagon furnished with a set of wide-tired wheels to run when the roads are likely to be cut up by the running of narrow-tired wheels; by this device, and by the proper drainage of the roads, I look to see them easily passible during three-fourths of the time that they now are nearly impassible, with a corresponding gain to all concerned. In brief, I look to see more brain work directing hand labor in all farming enterprises, and as a result I expect to see many millions of dollars added annually to the profits of farming in the State of Illinois. In this way I expect to see the State maintain its leading position as the first agricultural state in the Union, and that in the value of its lands, in the aggregate product of its farms, in the numbers and value of the live stock, the footings of the census of 1910 shall double the similar quantities set down in the census of 1880.

Concerning the manufacturing interests of the State and their progress it is less easy to predict with confidence. Much depends upon outward circumstances. I am not here to argue the vexed question of the tariff, whether for protection or for revenue, or of either upon manufactures. A large part of the manufactures of Illinois, like that of leather, and lumber, and flour, and agricultural machinery and wagons, and the packing of meats, and the distilling of grain, is so little assisted by any tariff, as to feel it rather in what it pays than in what it receives.

From now forward there must be a constant expansion in the output from the coal deposit beneath the surface of the State. Mines are constantly opening, and those that are open constantly extend their operations. Upon the plentiful development of the coal more than any other thing depends the certain and enduring prosperity of the manufacturing interests of the State. The question of fuel is the question of power. The question of power is predominant. New England was forced to become a manufacturer because her soil is too barren to give her a living, while every streamlet that sparkles down her hillsides leaps with joy over countless dams and vexing turbine wheels, and so furnishes power almost for the asking. Pennsylvania's power as a manufacturer lies in her veins of anthracite and bituminous coal, while the proximity of both New York and Philadelphia to the same sources of power, gives to the two cities an aggregate production of nearly $800,000,000 per annum, being more than the totals of either state of New York or Pennsylvania. So will it be here in Illinois, that the development of her manufacturing interests, except so far as they rest upon her agricultural prosperity—furnishing that which the farmer needs to use in carrying on his work, or reducing the bulk of his product for the better transportation—the progress of ordinary manufacturing will depend upon the development of fuel.

About the great lakes lies a coronet of grand states, like the stars in the constellation of the Northern Crown. New York is the brightest jewel in the east, Illinois in the west, while Pennsylvania and Ohio lie between. In population, in wealth, in every form of active vital force, these states singly surpass any other states of the Union, and in the aggregate they dominate all the rest. For the last thirty years the President of the United States has been chosen from one of these states, and during all that time the occupant of that great office has but once come from elsewhere.

In the next thirty years, as in the past thirty years, Illinois may safely be counted one of the four leading states of the Union. The place she will occupy in this quartette is of less consequence; though by reason of her larger area, her greater ratio of useful soil, and the assured predominance of her chief city, it may not be unreasonable to suppose that even by the end of the passing decade she will have outrun Ohio.

But let us set all ideas of rivalry aside. There is vastly more of mischief than of good in state rivalry, state pride, state glorification. All the states are simply integers in that larger integration which absorbs all, and unifies all, and consolidates all in the grander, nobler, and more glorious nation, the United States of America. One who has lived long enough in each of eight different states to become a voter in each, who has learned to love them all, to honor them all, to revere them all, to find a home and friends in all, to be jealous for the reputation and anxious for the welfare of them all, has from them all learned the lesson that state lines are the most insignificant of boundaries; that the air is as free, friendship as sweet, liberty as dear, patriotism as buoyant, and all that makes life lovely or noble is as abundant on the north side of the homely rail fence that happens to mark the parallel of 42 degrees and 30 minutes, which parallel divides Illinois from Wisconsin, as on the south side of the same rustic barrier. A man's citizenship in America reaches from the lakes to the gulf, and from the eastern to the western sea. His patriotism should be as broad as his citizenship. Yet there is a reasonable satisfaction, there may arise a proper pride from the remembrance that one is a part of a great whole, whether that whole be the nation, or the state, or the city, or any lesser organization of which he is a part.

May it not be a cause for congratulation, as well as of profound interest and of serious reflection, that within the possible lifetime of most who are here present, within the probable view of all the younger men of this audience, Illinois shall have within its borders five millions of people, and at least $4,000,000,000 of visible and tangible wealth; that that wealth must be chiefly of a sort which will be generally distributed among the people; that therewith shall exist all the intelligence and influence, the comfort and culture, the advancement in education, morals, religion, which nature, and art, and sturdy, persistent effort will make the necessary adjuncts to such a gathering of people, such an increase and aggregation of wealth, amid the surroundings of the closing nineteenth century.

Whose things shall these be?

Illinois will for many years remain one of the dominant powers

of the American Union; in a large measure influencing, guiding, controlling. Who will influence, guide, control Illinois? Public sentiment, the popular will, makes the government in these states, and in this State. Who makes public sentiment? Who wields the popular will? Questions of public policy, of party rule, of the choice of public officers, are decided by the votes put into the ballot-box. The voters, like the drifting clouds, deposit the tiny sheets that like gathering snowflakes pile up by the millions, and the end of an election day finds the policy of the nation perpetuated or changed. We are the voters, but there is an influence, silent, unseen, resistless, that compels us to cast our votes by swaying and controlling our convictions. They who direct public sentiment, they who control the popular will, they who cast the ballots, reaching into each hamlet and precinct in the land, are the men of thought, and will, and expression. Mind is mighty. Brain rules.

When war burst over our beloved land the hard question to answer was, not how many men can we gather, but who shall command the armies when they are gathered. As often as the president called for men, from every forest and prairie, from every city and every hamlet, from mountain side to the resounding sea, the men came trooping and singing as they marched,

"We're coming, Father Abraham, three hundred thousand more."

A few strokes of the pen could gather men by the hundred thousand, treasure by the hundred millions, equipments, arms, ships, stores in untold abundance. But the president called, and the nation waited many weary months, even years, amid discouragement, defeat, disaster and death, until a few men were found who were endowed with rare courage and wisdom, who were trained in the conflict of arms, who led our armies to victory and restored the land to peace.

Two classes of men feel that they of right ought to have a hand in guiding this greater Illinois. Each has reason for his faith and both may win. There need be no jealousies between them. Let them go up together and occupy the land.

The first class contains the farmers. They know that they chiefly have made the State. That they reclaimed it from the wilderness—a wilderness which forty years ago many thought irreclaimable and scarcely habitable. They compose almost a majority of the people of the State. They can choose and do elect a majority of those who are our lawmakers. They feel that they have to bear a large part of the burdens of production, and that they are largely the prey of all speculative interests and monopolies.

The second class is the young men. Full of the consciousness of power in earnestness and zeal, ere yet enthusiasm has been chilled by experience, they are eager to wield the power that is theirs. In the long procession of their elders, from whose hands the weapons of warfare are continually dropping while they quietly fall out of the ranks and join the silent majority, the young men are struggling to get into the van, to march well up to the front, right by the music. They will soon find the van, for in that procession the van constantly melts away.

For both these classes there is one condition on which they may secure the coveted leadership; that is, the demonstration of capacity

to lead. The farmers must not only put their heads together, as they are somewhat accustomed to do, but they must put competent leaders at the head. The young men will secure the influence they desire only after such a discipline as shall secure for them these elements of strength.

Thorough self-appreciation, weighing themselves as they are and not as they would be esteemed.

Self-reliance, based upon clear and just self-knowledge.

Self-control, developed it may be by sharp, even by bitter experience.

Self-culture, in such varied directions as may produce not one-sided, but well balanced symmetry.

Self-development, to the extent which will make the most and the best of the talents committed to their care.

The men so made are they for whom the world waits. For all such there will be sure employment, rapid promotion, distinguished honor, large responsibilities, and grand opportunities in the Greater Illinois.

EXPERIMENT IN SILK-CULTURE.

REPORT TO THE TRUSTEES, SEPTEMBER, 1884, BY T. J. BURRILL, PH. D.,

Professor of Botany and Horticulture.

At the March (1884) meeting of the Board of Trustees, one hundred dollars were, upon my request, appropriated for an experiment in the feeding of silk-worms. Two ounces of eggs were purchased of Mr. Chas. Woodworth, of the variety known as French annuals. These were from moths raised by Mr. W. the year before in Champaign, Ill., osage orange leaves having been used as the food plant. The insects had very satisfactorily grown and matured, yielding good results, and were apparently free from disease.

In order to keep back the time for the hatching of the eggs, that the work with the worms might come during our summer vacation, they were placed, with plenty of fire-dried paper, in a fruit jar, sealed, and, May 22nd, put into an ice house, where they were left until June 12th. Upon this last date they were placed in a room in the University building, and commenced hatching June 21st, and continued to appear until June 28th. The greatest number during this time hatched on the 22nd. Nearly every egg hatched, and all seemed perfectly healthy.

About 1,000 eggs were received, May 24th, from Mrs. J. M. Milligan, of Jacksonville. These were also French annuals, fed the year before on osage. The eggs had been kept in a cool room up to the time of shipment, but the weather had now become quite warm. Hatching began May 30th. But few larvæ appeared, and

these seemed weak and unhealthy. All of them soon died, scarcely one living to be one day old. For this result we have nothing of fact. Probably the embryo worms were injured in transit, either by jarring or by exposure to unfavorable temperature. This lot did not come in contact in any way with the others.

As near as could be estimated, we had eighty thousand young worms—the full amount usually obtained from the quantity of sound eggs (2 oz.).

The dissecting room of the veterinary infirmary was cleaned and fitted for the purpose, and here the worms were given the freshly cut twigs of osage orange taken from the hedge on the west. Racks were constructed and small limbs were laid on the open floors thus formed of widely separated bars. As the leaves were consumed, fresh limbs were laid on, the worms soon crawling up for the new food and leaving the old to dry beneath them. This method of feeding requires much less work, especially with osage, than is required to pick the leaves themselves and feed them, as is done, on perforated paper; while in dry weather the food remains much longer fresh, and the rubbish accumulating soon dries and remains odorless and harmless.

Everything seemed to be satisfactorily progressing until July 28th. A very few cases of *muscardine*, a well known but not very destructive disease, had been noticed. About a dozen larvæ died of this malady. These were preserved as specimens for the cabinet. Also a very few died from time to time from unknown causes; but so few as to attract no attention, since some are expected to die from parasites and to be injured in one way or another in handling. On the 25th of July—thirty-four days from the time of hatching—the first cocoons were spun, and between this date and the 29th of July one hundred and eighty-three cocoons were obtained. These were for the first three days of good size and quality, fully up to the average of successful cultures; but the last ones produced—on the 28th and 29th—were poor, having much less, in many cases, than the average amount of silk. After the 29th only a single larva lived to spin at all!, and this one on a tree in the open air, August 12th.

Forty-two of the cocoons supposed to be good were sold or given away to interested parties, and one hundred and eleven which seemed full size were selected and allowed to transform; but from them only eight female and fourteen male moths were obtained. One of these females was not healthy and did not lay eggs; all the others were apparently free from disease, and from the seven females the usual number of eggs were obtained. These eggs we now have on hand. Of the cocoons spun, there were one hundred and nineteen retained in our possession which did not produce moths, showing abundant ravages of disease after the larvæ were full fed and able to spin.

Some of the worms died, as usual, as well after the 28th of July as before, from insect parasites, wounds, etc. But the total number of deaths occurring from all such causes were so few that no account need be taken of the loss in practical sericulture. At first we thought there was good evidence of two distinct diseases of a

contagious character. In one case the affected larvæ became restless, ceased eating, the skin assumed a decidedly yellowish tint and ultimately became very tender and easily ruptured, while the blood, unusually copious, was thin and yellow instead of its normal limpid or grayish color. Other larvæ became sluggish, continued to eat, but consumed only a small quantity of food, the body gradually became flaccid, the skin wrinkled and tough and the color a grayish or leaden tint, and finally nearly black. These, hours or even one or two days before their death, adhered by their prolegs, or some of them, to a support, and remained quiet, at length only showing signs of vitality when touched, and at last dying while still firmly anchored to the limb or other object upon which they rested. After, and for some time before, death the flaccid body hung directly downward from the point of attachment. If this latter happened to be near the middle of the body, the two ends hung down, the parts nearly parallel with each other. From these dead and blackened worms a decided and characteristic odor of putrescence was perceptible, tainting, when numerous, the air of the well ventilated room.

On microscopic examination, the blood of those last described was found to contain great numbers of a *Bacillus*, a genus of bacteria which is now known to contain several species of true disease producers. To obtain the blood for examination free from the other fluids of the body, the end of one of the prolegs was snipped off with a pair of scissors, when a drop exuded and was at once secured upon a glass slide. The yellowish blood from those first described seemed perfectly free from living organisms so far as could be ascertained by microscopic examination; yet in one case out of the numerous worms examined, the same or similar organisms to those above noted were found. These, or similar, organisms were, however, found in the alimentary canal of all the worms examined which were supposed to be affected with these contagious maladies. Packages of both kinds were several times sent Professor Forbes, who, as is well known, as State Entomologist has made a special study of the diseases of insects, and especially of those of a contagious character; the reports of his examinations correspond with that above, except that no organisms were certainly found in the blood of any of the diseased but still living worms. In his attempts to cultivate the intestinal organisms, as well as to test the blood in nutrient fluids, another organism belonging to the genus *Micrococcus* (also included among bacteria) was constantly found, and this, upon trial, proved destructive to other caterpillars in a manner similar to the disease or diseases of the silk worm.

Professor Forbes inclines to the opinion that the two classes of symptoms as above given really belong to one disease, due to one specific organism, and that the apparent differences, marked as they seem, are on account of the parts of the caterpillar's body specially affected. This difference may be due simply to the mode of communication of the disease agents, and the organs of the body first reached. The presence of the *Bacillus* in the blood of the specimens examined by us may be accounted for, perhaps, by the fact that in some cases the alimentary canal is perforated either by rupture or

by gangrene-like sloughing, permitting the escape of organisms into the surrounding spongy tissue and directly into the blood. Our attempts to cultivate the organisms in meat broth were not satisfactory on account of the introduction of other forms of bacteria. Comparatively little time was given to this last part of the work.

The class of symptoms of the first kind enumerated above, together with a part of those of the second class, agree with the careful and comprehensive descriptions given by Pasteur of the disease of the silk-worm called *flacherie* or sometimes *morts-blancs*, *morts-plats*, *maladie des tripes*, etc.; but differ conspicuously from the same author's description of *pébrine* otherwise called *gattine*, *maladie des corpuscules*, *maladie des petits*, *atrophie*, *négrone*, *pétéchie*, etc. *Schlaffsucht*, a German name, seems to be a synonym of *flacherie*. The French term *grasserie* appears to be properly applied to another disease of not great virulence, though it has been also used for *flacherie*. Pasteur argues with much force, from many very convincing experiments and investigations, that there are but two seriously destructive diseases of the silk-worm in France, viz.: *pébrine* and *flacherie*; and the results of his labors upon these maladies are well known to have saved to France one of her great national industries. In 1853 the product of that country of dry cocoons was 26,000,000 kilogrammes; but from this date the amount became gradually reduced until in 1865 but 4,000,000 were obtained. In this last year alone the estimated loss to the country was 100,000,000 francs. It is a sufficient commentary upon the value of the researches of this eminent investigator to say that by following his advice this great loss is almost entirely avoided and that the industry has fully recovered its former magnitude and value. The worst of the two diseases was undoubtedly *pébrine*, and this is the one most effectually controlled. So far as I know this has not been certainly found in America, though various reports of this kind have been published, by persons not specially qualified to judge.

According to Pasteur *flacherie* may be either accidental or hereditary. That is, the healthy larvæ from sound eggs, in new and clean surroundings, may become affected, or the disease may be communicated from generation to generation, or from the *debris* of former culture. Unlike *pébrine*, however, the organisms to which the disease is ascribed are not found in the eggs themselves, however the vitality of the latter, and the larvæ from them, may be reduced and so predisposed to any form of disease. It is not therefore possible to state by an examination of the eggs whether or not they are suitable for use in this respect. The germs may adhere to their surfaces as to any other object; but, in such case, it can never be easy to demonstrate their presence or absence in a practical way, by microscopical inspection.

It is, however, positive that *flacherie* is contagious. When once introduced it rapidly spreads and soon affects the whole number feeding in a room or in any way closely associated. If the *debris* of an infected lot is permitted to dry and become powdery, the particles floating in the air may communicate the disease; but it is not probable that this will take place at any considerable distance except in rare instances. The more common method by which the malady is contracted is through the contamination of the food.

I am not aware that any one has positively determined the existence of true *flacherie* in America, neither do I know of any careful studies of the diseases of the silk-worm in our country. It has frequently been asserted by the advocates of sericulture for our people, that the seriously destructive diseases existing in the Old World were not known on this side of the Atlantic. Since the beginning of the experiment of which this is a report, correspondence with individuals and associations prominent in the introduction of the industry in the United States, reveals an apparent ignorance, if not denial, of the existence of either of the virulent maladies herein mentioned. But having heretofore paid little attention to the subject, and making no attempt now to exhaust the literature, I can not with any confidence say what has, or has not, been published from a practical or technical standpoint, though well assured that nothing has appeared in the scientific periodicals or reports indicating the occurrence of *pébrine* or *flacherie* in the New World. In the "Manual of Instructions for the Production of Silk," published as a part of the report of the Entomologist of the United States Department of Agriculture for the year 1878, and reprinted with emendations as a special document in 1881, after some description of *muscardine* and *pébrine* with others of less note, as known in Europe, it is stated: "All these different ailments and others not mentioned, have received names, some local, others more general; but none of them warrant further notice here, as they are not likely to become very troublesome if proper attention and care be given to the worms." The opening sentence of the part devoted to "Enemies and Diseases" is: "As regards the enemies of the silk-worm little need be said." This seems to have been a common opinion among those who have written most upon the subject of silk-culture in our country. Our experimenters do not appear to have been aware of the fact—if it exists—that the disastrously destructive diseases so well known and so much dreaded in the Old World also affect the worms raised in the United States. They have known, it is true, that the worms sometimes died in numbers, and doubtless of instances where the loss was total, as in our case; but the trouble has been laid to defective food, bad ventilation, unfavorable temperature at critical periods of development, want of cleanliness, etc., rather than to any contagion, the virus of which multiplied and spread like that of measles and small-pox among human beings. Indeed, until recently the subject of the diseases of insects of any kind except from insect parasites, has received no attention in America. It may be said that the studies of our present State Entomologist are the first worthy of record in the matter. His investigation of the diseases of the chinch-bug in 1881, by which it was shown that a contagion due to bacteria swept them off in prodigious numbers, is the first of its kind. Last year it was similarly shown that several kinds of native or introduced caterpillars were likewise destroyed by organisms belonging to the same class. In our own vicinity the larvæ of the cabbage butterfly (*Pieris rapæ*) were nearly all killed by such a contagious disease. They died by hundreds within a few days, all presenting similar symptoms and all containing in the body-fluids the same living organism. Moreover this organism, after "culture" in meat broth, so as to produce myriads

of which free from admixture with other living things, invariably communicated the disease when sprinkled upon the food of healthy worms. Further experiments are now in progress to determine whether this and similar diseases can be artificially introduced among noxious insects, with very promising indications. What specially interests us in the subject of this report is that this disease of the cabbage-worm is very similar to, if not identical with, the malady so certain described of the silk-worm. The organism found by Professor Varley in cultures from our silk-worms as before mentioned, seems to be the same as that of the cabbage-worm and to make the identity still more plausible the infected silk-worm material proves very deadly to the cabbage-worm.

It had been previously suspected that the disease of the cabbage-worm was the same as that described by Pasteur as *flacherie*, and this is now almost certain. This makes it conclusive that *flacherie* does exist and doubtless has existed many years in America, not only among silk-worms but among native and naturalized lepidopterous insects. It is indeed possible, even quite probable, that our silk-worm disease of this year came from the virus of last year's cabbage-worms, however this disease-producing organism passes the winter.

If now we turn to the conditions of food, climate, etc., some facts may be enumerated which may be corollated with the outbreaking of the disease. The temperature for the latter part of June and the first three weeks of July was for the most part very high, the thermometer often showing at mid-day in the shade from 80° to 90° Fahr., and exceptionally higher. During this time moderate showers occasionally fell, but by the last of this period the ground became quite dry, and fears were entertained of an injurious drouth. The silk-worms remained healthy and promising: their growth was in every way satisfactory. On the 23rd of July a heavy thunder storm introduced a period of remarkable rains, accompanied usually with strong winds. On the 24th many trees were blown down, and the drifting rain, which fell in torrents, flooded the room in which the silk-worms were fed, the windows being partially open at the time. On the 25th, another heavy thunder storm occurred, and on the 26th and 28th prodigious quantities of water poured down from the thick clouds. Everything became soaked with water, and great floods swept over the fields and down the valleys.

It was during these days of rain that the silk-worms began to die, and though many lived for some weeks longer, only a single one, as has been stated, survived to spin after the 29th. It was impossible during a part of this time to secure the leaves for food as dry as was desired, and the whole atmosphere being saturated with moisture and the temperature continuing high, fermentation became very rapid, and in spite of efforts to prevent it, a bad scent was at times perceptible in the room.

Under this state of things it would certainly have been said by most persons that the disease was due to the weather and the unfavorable conditions of the food and the room, and this, in one sense, may be accepted as true. That the worms came from good

eggs and were for a considerable time perfectly healthy and wholly free from the malady which finally overtook them, we have the best of evidence. The disease which carried them off was not hereditary. It was not lurking unobserved during the more favorable weather in the living or dying worms. Its introduction occurred about, and probably at, the time of the first of the heavy rains spoken of, but we confidently know that it could have been artificially introduced without the rains or the wet weather at all. Moreover, the worms continued to die after the weather cleared up and after every precaution had been taken to put them under the best possible conditions. We constructed new racks in a room not previously used, picked out the healthiest worms and moved them to the new and clean quarters, where afterward the temperature and other conditions were as favorable as could be desired; but the ravages of the disease continued with no perceptible abatement. To further test the matter, other apparently healthy worms, voracious feeders, growing rapidly, were put out upon the open hedge, where they were watched from daylight until dark to keep off the birds, and where, for a time, they seemed to thrive under the favorable skies and wide isolation; but here, too, they gradually fell victims to the destroyer. In each of these places about five hundred worms were placed, from which, as was before said, one cocoon only was secured, and this from the out-of-door lot. The latter did live longer than any of the others, but at length as surely succumbed. Another experiment proved equally futile, viz.: that of spraying the food with an aqueous solution of carbolic acid. No apparent improvement followed this treatment.

It may be said that our disaster followed in consequence of retarding too long the hatching of the eggs by keeping them in an ice house, thus pushing the feeding season out of the natural time and subjecting the worms to unfavorable summer heat or providing them with leaves too far advanced towards maturity. This might, indeed, seem plausible had not several other lots, fed in the vicinity but not so retarded, died in the same way. It is interesting to note that in some of these small and isolated experiments in silkworm feeding, certain lots from the same kind of eggs as our own, produced from the same lot of moths, fed on the same kind of food, remained perfectly healthy and produced good cocoons, while others totally failed. It seemed that in every case where what appeared to be the disease called in this paper *flacherie* became once introduced, few or none of the worms lived to spin passably good cocoons. Most of them died after the third or fourth moults and after, therefore, no little care had been bestowed upon them.

As a contribution to the facts relating to silk-culture, and especially to the disease in question, I append a table of the experiments that have been tried in the vicinity by individuals, and the results, so far as they could be ascertained. Nothing of importance can be said as to the financial results in any of these cases, only that no one who has tried the work seems to be very sanguine about the profits either under present existing conditions or such as are likely to occur. It is probable that the expenses of our experi-

ment would have been nearly met if the worms which lived beyond the third moult had all spun good cocoons; but nothing beyond moderate wages could have been made.

The real expenses were as follows:

Two ounces of eggs	$10.00
Racks for feeding (material)	4.40
Window screens	1.20
Pruning shears	75
Thermometer	50
Broom	25
Stove repairs	1.20
Paper, etc	66
Labor	45.50
	$64.46

There are on hand materials which may be inventoried as follows:

Racks for feeding	$5.00
Pruning shears	50
Broom	10
Stove repairs (not used)	1.20
	$6.80

The few cocoons and the eggs on hand can not be considered worth anything in money. The latter may be of service in testing the hereditary character of the disease another year. The cocoons are placed in the museum.

The work was done and most of the arrangements and plans for feeding were devised by Student Charles Woodworth, who certainly labored faithfully to secure success in the experiment.

PARASITIC FUNGI OF ILLINOIS.

UREDINEÆ.

By T. J. Burrill, Ph. D., *Professor of Botany and Horticulture.*

INTRODUCTION.

Most of the plants described in this paper were collected, with many other leaf parasites, in Illinois during 1881 and 1882, by Mr. A. B. Seymour, who was employed for the purpose by the Illinois State Laboratory of Natural History.

The entire collections consist of three thousand seven hundred and eighty-four numbers, many of which are, of course, duplicates or are different stages of the same species, leaving, however, a very large number of distinct specific forms, much larger than is usually supposed to exist in our flora. Only such as belong to the order Uredineæ or the "rusts" are included in the present list.

The determinations have been made at the Illinois Industrial University by myself, efficiently aided by Mr. Seymour. For this work, besides the facilities offered by the library and herbarium of the University, the State Laboratory of Natural History furnished many books and specimens. Among the latter are the following sets of exsiccati: DeThümen's *Mycotheca Universalis*; Ellis' *North American Fungi*; Ravenel's *Fungi Carolinani*, and *Fungi Americani*.

The entire work has been stimulated and aided in every possible way by Professor S. A. Forbes, as director of the State Laboratory, and as an earnest and efficient worker in our rich fields of scientific and practical biology. Acknowledgments are also gratefully made for assistance, in various ways, especially in the determination of specimens submitted to their inspection, to Professor W. G. Farlow, and the State botanist of New York, Chas. H. Peck; to F. S. Earle, J. C. Arthur, and C. A. Hart, for the contribution of specimens found by them in Illinois; and to Professor Wm. Trelease, J. B. Ellis, and others, for many favors.

It needs no argument to show the practical value of the studies undertaken upon these minute—probably degraded—members of the vegetable world, for they subsist on living plants of the higher orders, upon which our domestic animals and ourselves depend for the means and materials of physical existence. It is not, indeed, usually known or suspected what proportion of our crops and useful vegetation is destroyed, or rendered unfit for food or other purposes, by the microscopic growths which live as parasites or saprophytes upon them; but when we come to understand that in a very great measure the things called "blights," "mildews," "rusts," "smuts," "rots," "ferments," etc., are really due to the despoliations of these same microscopic but multitudinous forms of fungi, some appreciation can be gained by any one, even with a moment's thought, of the immense aggregate loss that occurs. Perhaps, in one sense, it is

well that cultivators do not fully realize the number and variety of parasitic growths which await the development of their valuable plants, and which are liable to so badly injure the latter, and so seriously affect receipts for the expended labor. Surely, in many cases, there would be sufficient ground for discouragement and hesitation to venture in opposition to such an array of dangerous enemies, against whose insidious and covert attacks fighting seems futile. But knowledge of the existence of such things can not make that existence more hazardous nor the results more distressing, while here, as in the other battles of life, to be forwarned is to be forearmed. Knowledge is power, and as much so in this case as in any other; if the latter is still wanting, it is only because the former has not been attained. Is it attainable?

There are difficulties in the way. The objects are very minute; we can not see them by the unaided eye as individuals; we can not thus watch their modes of dissemination, germination, growth, and development; we only see them, if at all, in the mass, and know of their presence by their results. They have singular, and to the students of other forms of life, unfamiliar physiological powers and properties; they assume peculiar disguises and pass through unlooked for stages of development of which the connecting links are hard to make out; they lie dormant now, and again become wondrously quickened and enormously multiplied, under circumstances not readily traced. But, little by little, qualified observers have acquainted themselves with their existence as true species, veritable and distinct plants; and, little by little, have learned something of the mysteries of their life histories. Sometimes the advance in knowledge is gained by casual and lucky observations; but mostly by painstaking, systematic research, aided by all the appliances of the equipped laboratory and the fruitful skill of trained powers of manipulation and acute perception. A step gained is not only so much secured, but renders more possible other or further advance. The more that becomes known, the easier progress is made, since that already acquired points the way towards new achievements. The beginning has been made, though this can scarcely be said to have been true until within very recent times. The men are now living and working who have made known nearly all the ascertained facts of physiological processes and results in these parasitic fungi. The germination of fungous spores was not observed until within the present century. During the last part of the first half of this century, learned discussions arose upon the specific distinction between the parasite and the host, and esteemed botanists held to the view that what was taken for the former was but a diseased condition of he latter—the rust of wheat, for example, was only the degraded cell-tissues of the wheat itself. Such difference of opinion, however, no longer exists among those who have possession of the information now acquired. The tissues of higher plants do not change by any process of degradation or transformation into the things called fungi; neither do the latter originate in any other manner than as descendants from preexisting parent forms through as rigid specific lines as can be traced among any animals or plants. It is known, too, that however much the fungus is found within the tissues of the host plant, it began its growth outside of the latter, and gained introduction

only by forcible entrance. Spores are never taken up by absorption and carried by the aqueous currents from part to part of the plant. The fungus passes through the tissues very much as roots pass through the soil, sometimes apparently without, in any degree, successful opposition, sometimes nearly or quite baffled in the struggle by the mechanical and physiological resistances of the host plant.

I repeat, we now know that the numerous "rusts," "smuts," etc., found on the various kinds of vegetation, are themselves true plants and that as such they are limited in their development like other organic species by certain conditions and surroundings.

Some of these limitations are well known, others are yet to be ascertained. At present there is, except in a few cases, not enough of trustworthy information to enable us to suggest practical remedies or means of effectually destroying the injurious fungi, which so reduce the products of our fields, fruit plantations and gardens, disfigure our ornamental trees and defoliate our forests. But the difficulty exists not so much in the unconquerable nature of the enemies as in the want of fuller attainable knowledge concerning them and their ways. There is reason to predict that the time will come when the mastery of man will prevail in this as in so many triumphs of the past, by the application of power made available through persevering research and educated perception.

In some cases, however, we do know of practical methods of exterminating the parasites and of preventing their ravages in other cases by various processes of cultivation, selection, or application. Usually these methods are quite beyond hap-hazard discovery, and often very remote from previous conceptions of what should be done.

For example, the leaves of apple trees are sometimes destroyed by a parasitic fungus which shows itself prominently in scurfy bunches occurring here and there on the underside of the affected leaves, while upon the upper surface of the same spots the thickened area has a yellow or sometimes crimson color. The leaf is distorted in shape, shows very distinct signs of injury and finally becomes ragged and withered. When a large number of the leaves of a tree are thus diseased the latter perceptibly suffers, and though seldom killed outright, after an unequal struggle for some years is rendered entirely worthless and may as well be removed by the ax in the hands of the disappointed proprietor. Now the injury arises from a parasitic fungus described below (*Gymnosporium macropus*), which, as an alternation of development, takes a very different form on the common red cedar, constituting the so-called "cedar-balls," of orange color, especially noticeable after a rain in the month of May. The relation of these two forms of the fungus was not suspected until carefully established with European species by Oersted, a botanist giving special attention to such matters, and well qualified for such observations and experiments. The fact having been ascertained, a thoroughly practical remedy consists in clearing away the worthless red cedars, or, in case of a few of these trees which for any reason are wished to be saved, by picking off and burning the "cedar balls." In this case the spores produced on the apple leaves can not germinate and grow on the apple, but must reach by wind currents or otherwise the cedar leaves where alone one essential stage

of development takes place. From the cedar the spores must again be carried to the apple tree, thus alternating back and forth as a necessary requirement of continued existence.

This is by no means a solitary example of known alternations which render possible the agency of man in preventing plant diseases caused by these pernicious parasites; but to gain the fullest possible mastery we still need much investigation and experiment by those most competent to conduct them. It has long been known that the rust of wheat (*Puccinia graminis*) has an alternate form on the leaves of the barberry bush, but since the rust occurs in vast regions of our country where no barberry exists, we know that this plant is not positively essential to the continuous development of the rust. It now seems probable that the barberry stage is a reality and perhaps in some way beneficial to the *Puccinia* (rust) but not essential. It still remains, however, to be ascertained whether or not there is some other common plant usually found in or near the wheat fields which takes the place of the barberry, and thus permits the continued growth of the rust. What might be the practical value of investigation in this direction! There are annually produced in Illinois about 50,000,000 bushels of wheat. The destruction of one hundredth part of the crop by this fungus probably falls far within the actual limits of loss as an annual average. This represents 500,000 bushels, which at seventy-five cents per bushel is $375,000. If it could be demonstrated that the eradication of some worthless or otherwise noxious weed would at the same time dispose of the rust fungus, what a step of progress would be made! It can not be said from what we know that this is probable, but it certainly is possible, and not this only. In such cases no estimates can be ventured as to the value measured in dollars and cents of the smallest contribution to positive knowledge. Years of patient and able research may pass without reward, or a day's labor may beneficently affect the world. The field is very large and the soil very rich, but the cultivators have little more than begun their labors, and those competent for the task are still too few. No great pecuniary inducements urge them forward. There are no patents to be had on discoveries they may make. The products of their labors, however rich, are not to be appropriated by themselves; but the gathered harvests must be equally divided among all men. Science may be enthusiastically pursued for its own sake and mankind owe much to labors thus pursued; but it is certainly proper that the State should provide the means of equipment and livelihood for those able and willing to devote their energies to such investigations and experiments.

Illinois is one of the few states of the Union which has provided by legislative action for an officer whose duty it is to investigate and report upon insect depredations, and is alone in the establishment of a well equipped and well appointed Laboratory of Natural History, while the maintenance of the State University, with its departments of science and practical art, shows the highly official appreciation of studies and investigations of this kind, and the intelligent views of those shaping and directing the affairs of the State pertaining to our natural resources and the value of natural science. The beginning thus made gives much hope for the future. It is

not hazardous to predict increased interest as the work goes on, not only on the part of those conducting the investigations, but among the people at large, many of whom care little for the methods and processes by which results are reached, though they quickly appreciate the practical value of the results themselves when wrought out.

Nothing has so far been done by the United States authorities for the study of the diseases of plants, though recently much attention has been given to contagious diseases of animals. The importance of scientific investigations in this latter direction can not be overestimated, yet it would not be difficult to show that every argument for these studies is applicable also to those of the diseases of plants. In fact, it has now come to be generally admitted that these very maladies of animals are directly due to various species of the same classes of low vegetable organisms which afflict as parasites the valuable plants and crops. In some instances the very same species of fungi prey upon plants or plant-products and living animals. The common moulds are fungous growths, and mouldy grains and other articles of vegetable foods are commonly believed to be injurious to man and animals. Some contagious diseases of man have been proved to be due to organisms normally living on vegetable substances, and there is much reason to suppose that all the pathogenic bacteria and their allies are, or were primarily, simply decomposing agents of dead substances.

Certainly the nature of the contagious diseases of animals can not be fully known without the closest investigations of the life of the disease organisms outside of the animal body. The studies of fermentations and putrefactions have already led to most important results in pathology, and it is confidently believed that there is much more to be gained in the same way for the advancement of knowledge in regard to disease and injury not of animals only, but of plants as well; while a proper study of the diseases of plants must help to a better understanding of the serious maladies of man and of the domestic animals..

The nomenclature adopted in this paper has been the result of considerable inquiry and an earnest endeavor to conform to the latest opinions of the best authorities, as well as to most nearly fulfill the requisites of this branch of science.

Unfortunately, in numerous cases there are many synonyms, and, as names were given to species before any natural classification could possibly be made, and as the life history was in the earlier times usually unknown, different writers assigned the same species to widely different positions in their systems of arrangement. The descriptions by the older authors are meagre and entirely devoid of the accurate microscopic characteristics on which so much reliance is now placed, so that, in the absence of type specimens, it is difficult or impossible to ascertain to what species their names should be applied. Besides this, what we now know to be different forms of "fruit" of the same species, were formerly regarded as wholly distinct plants, belonging to widely separate genera; as each of these forms received a name, it now becomes necessary to choose one from two, three, or even more, to designate

the species, and reduce the others to synonyms. In the case of the *Uredineæ* there are in numerous species spore-forms now known as "teleutospores," "uredospores," "æcidiospores," and "spermatia," from which one must be selected as the mature or final "fruit," and its name taken for the species as a whole. But, as no process of fertilization has been discovered for any of these spore productions, there is a difference of opinion among investigators as to which ought to be considered this mature or final form. Sachs, whose judgment must be highly respected, adopts the æcidium stage as that most probably the result of some kind of fertilization; while others, equally competent, believe the teleutospores—as the name indicates—are the final, and if any, the fertilized bodies. Sachs, therefore, inclines to call the common rust of wheat *Æcidium graminis*, instead of *Puccinia graminis*, the name used by all authorities up to this time. Winter, in his recent revision of Rabenhorst's *Pilze* (Fungi), attempts to apply rigorously the law of priority of names to whatever form of the species the first name was given, and most naturalists making a specialty of any other department of nature would doubtless commend his endeavor. But there are very serious difficulties in the way. While we may accept as proved that certain Æcidia are genetic forms of known Pucciniæ, in the great number of cases such relation is simply *supposed* to exist. Shall we revise our nomenclature on the basis of a supposition? In the writings of early mycologists the descriptive characteristics following a name are often equally applicable to several species as we now know them. In the absence of herbarium types, shall we guess at the plant in hand when the description was drawn up? Not unfrequently the oldest name is given to what was deemed a variety, and later another name by another or the same author is adopted for the same plant as a species. Shall we now write the earliest varietal name as specific, and quote the first botanist as authority? The question is not whether the second writer should have adopted the first name; it is now a question of choice between two names already in literature.

The authority, after a binomial appellation, is clearly that of the one who associates the generic and specific parts of the name and applies it thus constituted to the designated plant. For phænogams there seems to be little need of preserving with the name any further item than this of bibliography. The change of genera is not so frequent as to cause serious confusion, and the descriptions are ordinarily full and unmistakable. Mycologists, however, find it important to quote the name of the original authority for the specific name, agreeing in this with the custom among zoological writers, especially with those who devote themselves to the lower and less known orders of animals. A very considerable number of the names of fungi must thus be accompanied with two authorities, that for the original specific name occurring first in parenthesis, and that for the binomial whole, afterward. It is true this decidedly increases the difficulty of writing and of memorizing, but the benefits more than counterbalance the drawbacks. Certainly it will not answer to quote alone that which is put in parenthesis, though the change of genus is in this manner indicated. The parenthetical reference is dropped by students of phænogams, and

we should, as mycologists, prefer this to the practice of some botanists and zoölogists in omitting the authority for the entire name as it exists.

Without further discussion of this often discussed topic, the following may be stated as adopted for the basis of nomenclature in this paper.

1. The use of the oldest specific name known to have been used for the *species* as such. Varietal names by the older authors, not subsequently adopted by those raising the varieties to species have not been herein perpetuated, except in peculiar cases. When the vague descriptions of the early writers give no reasonable certainty of the intended application, priority is not strained to retain the names.

2. In the *Uredineæ*, the names of the teleutospore and uredospore stages are alone considered in the question of priority. Æcidial names are not recognized, mainly from the uncertainty that exists as to the genetic connection of the forms, as well as the obscurity of descriptions, and the less value of herbarium specimens as types.

3. The name of the author responsible for the specific appellation has been appended, being inclosed in parenthesis, in case the generic association has been changed; and the name of the author of the binomial combination, whether the parts were adopted from others or not, finally follows. In a few cases this author is not known to me, owing to the too prevalent habit of omitting the citation.

The descriptions of species are taken from nature, and, as far as possible, from typical or average specimens. The measurements given are intended to include the variations which commonly occur in such specimens, but the extreme limits of exceptionally large or small spores are not indicated. In most cases the measurements were made of spores immersed in a solution of potash, so as to obtain the size of the mature but undried specimens. For the study of the surface markings, examinations were made when necessary of spores either dry or wetted with pure water, whichever method was found from experience to answer best the particular affects required. The color given is as closely as possible that of nature, rather than an interpretation of the appearance of a few spores in the field of the microscope. It need scarcely be said that the tint is much lighter in the latter case. Excellent objectives of different makers were used, and for the closer studies a magnifying power of about five hundred diameters was employed.

Notes are appended, when required; these are intended to record any special facts about, or information upon, the species. It has not been considered wise to try to give a full list of synonyms, yet such references are made in the notes as are needed to justify any departure from common usage in the selection of names. In a few instances changes have been made with much regret, since the current names have been well established, but in these cases the law of priority clearly demands the substitutions made. For instance, the rust on the leaves of the common sunflower, and other allied plants, has long been known as *Puccinia helianthi*, Schweinitz. Probably no species of *Puccinia* is more commonly found or better

recognized in the herbaria of our country, and nearly or quite uniform under the name quoted. But Schweinitz published this name in 1822 (Syn. Fungi Carol., p. 73), seven years after De Candolle had published the description of a species of *Puccinia* under the name of *P. tanaceti* (Flore Franc II, p. 222). Now, it is found that no specific difference can be maintained between these, therefore the latter name must be adopted for the collections made in America as well as for those of Europe.

Order UREDINEÆ. De Bary.

Parasitic plants of minute size, growing in the tissues of living phanerogams, or, in a few cases, of living vascular cryptogams; mycelium articulated, variously branched, penetrating, or growing between, the cells of the host; spores usually produced by constriction, singly or in chains, from the ends of fertile hyphæ (mycelium branches) formed beneath, rarely within the cells of the epidermis which is ultimately ruptured; fruit forms of different kinds, viz.: æcidia, spermogonia, uredospores, teleutospores.

The *Uredineæ* are parasites and affect a very large number of the species of the higher plants, being found most often upon the leaves, but also in some instances upon the stems and parts of the flower and fruit. Roots alone are free from their intrusion, and these probably because protected by the soil.

The most remarkable thing concerning the *Uredineæ* is their peculiar alternations of fruit forms—"dimorphism," "polymorphism" or "pleomorphism." The teleutospores, the last in the series and usually the only ones surviving the winter, emit upon germination a slender tube called the promycelium. This is never very long or complex in structure, but may be with or without septa, simple or branched. It produces at once, on minute stalks (*sterigmata*), one to several thin-walled, more or less globular bodies, rich in protoplasm, and known as *sporidia*. These in turn soon germinate by sending out a little tube which, upon the proper host, penetrates the tissues and forms the *mycelium*, or vegetative structure of the parasitic plant.

Then follow in order, as products of the mycelium, the fruit spores known as spermogonia, æcidia, uredospores and teleutospores. The two first are usually produced simultaneously or nearly so on the same infected area of the host; but most often on opposite sides, if of a leaf. In some cases the other fruit forms subsequently develop in the order named, upon the same mycelium; but in others only on a new mycelium produced from the germination of the æcidium spores, and either on the same or different host according to the habit of the species. These alternations may be best understood by consulting what is said under the genus *Puccinia*.

But this full series of forms is not found in all the species. Indeed there are comparatively few which are really known to have in their regular course of development all the stages as necessary requirements of growth. In a few instances it is known that species which under some circumstances have this or that form produced,

may under other circumstances perpetuate themselves, though one or more forms are omitted. In very many cases the genetic connection of different fruit forms has not been satisfactorily made out; but contributions to knowledge of this kind are from time to time gained, and through the interest now taken in the matter, more rapid advance may be expected. For this purpose artificial cultures with the most pains-taking care to avoid mistakes are required. The spores must be placed on the proper host under proper conditions, and the development carefully followed through the season. It is believed that in some species only teleutospores are produced, in others only uredo and teleuto forms, and these from the same mycelium, in still others only æcidia and teleuto forms. The office of the spermogonia has not been conclusively ascertained. Cornu of France has seen the spermatia from them germinate in certain nutritive fluids, but not in water, and he has supposed they may under certain conditions reproduce the plants like other spores. Many have attributed to them sexual functions but the proof is unsatisfactory. It has been observed that some spermogonia are fragrant and insects are known to visit them, hence the inference that the special office may be for dissemination.

In most instances the mycelium of these plants wanders little from the point of original penetration of the host-tissues—in this strikingly differing from the usual growth of the species of *Ustilagineæ* and some other groups of fungous parasites.

In leaves the vegetative threads are seldom found at a greater lateral than vertical distance, the latter limited by the thickness of the leaf; yet the whole tissue may be permeated by the mycelium of different, perhaps very numerous, spores.

In the preparation for the formation of spores the mycelium-threads become densely aggregated into a parenchyma-like tissue in a little area just beneath the epidermis and from the upper surface of this minute cushion the spores are produced by the enlargement and modification of a thread, either singly, or by the formation of septa, from two to several,—in the latter case so as usually to form a single vertical row from each fertile filament. The clusters (each called a *sorus*) of spores, usually very densely packed, are naked or surrounded by peculiar sterile cells (*paraphyses*) produced from the mycelium, or entirely inclosed in a membranous envelope (*pseudo-peridium*) originating from the same source.

By the growth of the fungus the epidermis of the host is pushed up and finally ruptured so that the spores, which are light enough to be carried as fine dust, are disseminated in the air.

The species of *Uredineæ* are limited to particular host species, each mostly to one or at farthest to the species of one genus or closely allied genera. None are certainly known to grow upon plants of different natural orders, except in the alternation of fruit forms. In the latter case the teleutospores produced upon grasses or sedges give origin in some species to æcidia on the leaves of certain exogens. In fact it seems to be most common that when the æcidia are not grown on the same host with the uredo and teleuto forms, very wide divergance in this respect is made. Wheat and the barberry bush, oats and the buckthorn, red cedars and apple trees are

three examples of this remarkrble peculiarity, the teleuto form in each case being found on the first named, the æcidia on the second.

In the descriptions of species the Roman numerals indicate the stage of the fungus, viz: I æcidium, II uredo, and III teleutoform.

Key to the Genera of Uredineæ.

I. Spores at maturity forming a more or less powdery mass.

A. Spores with a permanent pedicel, mostly smooth and dark brown.

1. Spores one celled ..... Uromyces.
2. Spores two celled, septum horizontal..... Puccinia.
3. Spores three celled, septa in different planes..... Triphragmium.
4. Spores three or more celled, septa horizontal..... Phragmidium.
5. Spores many celled, septa variously placed.. Ravenelia.

B. Spores with deciduous pedicels or none, one celled, mostly roughened with minute projections, usually yellow or reddish brown.

1. Sorus with a peridium, spores produced in vertical chains, without pedicels.
   a. Peridium cup-shaped, rim-border mostly toothed or lobed and recurved..... Æcidium.
   b. Peridium hemispherical or bowl-shaped, deeply immersed..... Endophyllum.
   c. Peridium elongated, usually cylindrical or conical, soon split-fringed above..... Rœstelia.
   d. Peridium various, bursting irregularly, white, on Coniferæ..... Peridermium.

2. Sorus without peridium.
   a. Spores produced in vertical chains, without pedicels, usually accompanied with spermogonia... Cæoma.
   b. Spores produced on pedicels (deciduous) not accompanied with spermogonia..... Uredo.

II. Spores at maturity embedded in gelatine, two-celled, septum horizontal, pedicel long..... Gymnosporangium.

III. Spores at maturity in a dense, waxy or crust-like stratum, not separating from each other.

A. Spores one celled, less commonly several celled and then the septa almost never horizontal, mostly dull reddish brown.

1. Spores one celled, oblong, united in an erect (often curved) cylindrical column..... Cronartium.
2. Spores one or more celled, septa when present mostly vertical or oblique, united in a flat or convex stratum..... Melampsora

B. Spores several celled, septa horizontal, mostly reddish or orange.

1. Spore cells short (not longer than wide) united in a flat waxy mass, cell-rows simple.....Coleosporium.

2. Spore cells oblong or cylindrical in simple or branched vertical rows, not waxy.....Chrysomyxa.

Genus UROMYCES, Link.

Teleutospores one celled, brown, produced singly on permanent pedicels, usually longer than the spore, arising from a compact layer of small irregular shaped cells beneath the epidermis which is finally ruptured, exposing the more or less powdery mass.

Like most of the genera of the *Uredineæ* the biological development of the *Uromycetes* is very complex and in the different species variously diversified. All the spore forms exist on the same or different hosts, or any one, or even all but one (the teleutospore) may be wanting.

In most cases the teleutospore germinates only after a considerable period of rest, but in a few species exceptions to this occur, and there are also exceptions in regard to the permanence of the pedicels. When the spores readily fall from the stalks they can then be known from the stalked uredospores by the different appearance, usually smooth instead of being roughened with minute, mostly sharp pointed prominences, or by the tardy germination when ripe. Puzzling forms occur, in which some of the teleutospores are divided like a *Puccinia;* but because a few such spores are found among many of single cells, the species should not be transferred to the latter genus unless there is good reason to suppose that the single celled spores are the abnormal ones.

In England the æcidial forms of the greater proportion of the *Uromycetes* are supposed to be known; but in our own flora, almost nothing has been demonstrated. In the following those species which probably have their æcidial forms on the same host are thus indicated in the notes.

U. hyperici, (Schw.) Cast.

I. Hypophyllous; spots small, scattered, purplish; peridia minute, about six (one to nine) in a cluster, semi-immersed, short; spores orange. II. and III. Hypogenous; spots small, light cinnamon or purple; sori numerous, scattered, uredo and teleuto forms often in same sorus, the latter succeeding the former. II. Sori small roundish, long covered by the epidermis, then surrounded by its ruptured remains; spores light yellow, globose to elliptical oblong, minutely echinulate, 19-27 by 16-19 μ. III. Sori becoming larger angular and conspicuous, ruptured epidermis prominent; spores elliptical or oblong, tapering to the base, strongly thickened at the obtuse or rounded apex, 12 by 21–27 μ; pedicel tinted once to twice the length of the spore. On *Hypericum mutilum,* and *Elodes Virginica.*

Cooke (Proceedings Portland Soc. Nat. Hist. Vol. I., part II., p. 184) described, under the name *Uromyces triquetra*, a species on *Hypericum* and questions its identity with the plant described by Schweinitz. Peck (25th Rep. p. 74) adopts the name given by Cooke, but Farlow (Ellis' N. A. Fungi 251) uses for what seems to be the same, Schweinitz's name. In the exsiccata specimens of Ellis' and the Illinois collections sori also occur on the stems; in this differing from Cooke's description of *U. triquetra;* and the spores are not commonly angular, certainly not usually three sided. The above description is drawn from specimens on *Elodes Virginica*. On *Hypericum mutilum* the sori occur on both stems and leaves, are smaller and rounded and the spores are rather smaller and lighter colored.

U. terebinthi, (DC.) Wint.

Amphigenous, spots yellow or yellowish red or none, usually small; sori minute, scattered or crowded, soon naked. II. Spores elliptical, often roundish or oblong, usually obtusely pointed, covered with spiral lines of minute warts or beads, yellowish brown, 25 by 25-40 μ, on a short hyaline deciduous pedicle. III. Spores vertically compressed, or globose, with an obtuse, cap-like point; verrucose with prominences in short, irregular, undulating lines; dark brown; about 25 μ long (vertical dimensions) and 30 μ wide; pedicles hyaline, stout, prominent, several times as long as the spore. On leaves, petioles and stems of *Rhus Toxicodendron*.

This is often referred to the genus *Pileolaria*, Cast.; but mycologists are pretty well agreed (Léveillé, Tulasne, Winter, Farlow, etc.) that the plant is not generically distinct from *Uromyces*. This being admitted, a further question comes upon the specific distinction of the American plant on *Rhus* from the European one on *Pistacea*, an allied genus. Ours was published in Ravenel's *Fungi Car. Sup.* (1855) under the names of *Uredo toxicodendri*, Berk. & Rav., for the uredoform and *Pileolaria brevipes*. Berk. & Rav. for the teleutoform, and the latter name has been commonly used, though the significance of the specific appellation is unintelligible or incorrect, for the pedicels are conspicuously long. Upon comparing specimens and descriptions of European and American plants, it does not appear that the latter can be maintained as a distinct species, hence the name previously given to the former has here been adopted (*Uredo terebinthi*, DC. Flore Franc. [1815] VI, p. 71). The teleutospores are not at all different, but in the poor specimens at hand of the European uredospores the spiral arrangement of the prominences can not be so well made out. However, Schroeter (Hedwigia XIV, [1875] p. 170) does not find any difference between them. Doubtless there is none.

It is peculiar that a difference of opinion should exist as to which of the forms is the teleutospore. In these specimens the yellowish, fragile-stalked form appears alone in the collections of July; in those of August, this is well scattered, but present, while the thick-walled, long-stalked form may be found in sori still mostly covered by the epidermis, and later (October) this last is found alone.

U. hedysari-paniculati, (Schw.) Farlow.

II and III. Spots yellow or none; sori amphigenous, scattered over the whole under surface of the leaf, few above. II. Uredosori small, yellowish brown, scattered; spores subglobose, echinulate, 18 by 21 μ. III. Sori small, compact, soon diffuse and confluent, brown or blackish; spores ovate or oval, obtuse, conspicuously papillate, reddish-brown, epispore thick; 18 by 21 μ; pedicels broad, slightly colored, slightly curved below, twice the length of the spore. On leaves of species of *Desmodium*.

In Schweinitz's Syn. Fung. Car. (No. 503) this species is named *Puccinia Hedysari paniculati*, but in his N. Am. Fungi (p. 297, No. 2,9.7), subsequently published, the name is *Phragmidium Hedysari*. The plant called *Hedysarum paniculatum* by Schweinitz is now transferred to the genus *Desmodium* with other species upon which the fungus also occurs. In March, 1878, (Hedw. XVII., p. 39), Cooke described the same plant under the name of *Uromyces Desmodii*, and Thümen at the same time (Bull. Torr. Bot. Club VI., p. 2.5) also bestowed the latter name upon the species with a still fuller and better description. Farlow (Ellis' N. Am. Fungi, No. 2,462, [1879]) restored the original specific name and wrote *Uromyces Hedysari-paniculati*, (Schw.).

U. lespedezæ, (Schw.) Peck.

II. and III. Hypogenous and often also sparingly epigenous; spots yellowish, very small; sori small, scattered, at first covered by the epidermis and lead colored, soon exposed, black, surrounded by the ruptured remains of the epidermis. II. Uredosori light brown, both kinds of sori often surrounded by curved paraphyses; uredospores pale, subglobose, 16–18 by 18–21 μ; epispore rather obscurely echinulate. III. Teleutospores rounded to oblong, with the rounded obtuse or pointed apex strongly thickened, frequently forming one-third of the length of the spore, blackish-brown, smooth, 12–15 by 21–27 μ; pedicel hyaline, rather broad, about 26 μ long. Paraphyses hyaline, of nearly uniform diameter, rounded apex, 6–9 μ broad. On leaves of species Lespedeza.

The so-called "capitata" form is common on most species except *L. Violacea*. Paraphyses usually accompany this form, and are mostly absent in the typical one, but many exceptions occur.

Schweinitz (Syn. Fung. Car. [1822], Nos. 497 and 498) describes this species under the two names *Puccinia Lespedezæ procumbitens* (497) and *Lespedezæ polystachyæ*.

U. fabæ, (Pers.) D. By.

II and III. Spots small, black; sori amphigenous, sparce above, scattered, round or oblong, black, surrounded by the prominent remains of the ruptured epidermis. II. Uredospores in roundish, small and inconspicuous brownish sori, globose or oval, obscurely warty, pale brown, 21–24 by 24–29 μ. III. Teleutospores roundish, oval, obovate, oblong, pyriform or often irregular, epispore smooth, apex strongly thickened, obtuse or rounded, 21 by 27–47 μ; pedicels broad, a little longer than the spore. On leaves of *Lathyrus palustris, L. venenosus, L. ochroleucus*.

Persoon in 1794 (Rœmers N. Mag. 1, p. 93) named a fungus *Uredo Fabæ*. and this is presumably the uredoform of the present species. In 1801 (Syn. Fung. p. 221) he described under the name of *Uredo Viciæ Fabæ*, what is no doubt the teleutoform. De Bary (Am. Sc. Nat. IV, XX [1863]) wrote *Uromyces Fabæ*, Pers. *U. viciæ*, *U. viciæ-fabæ*, *U. ervi*, and *U. orobi*, are synonyms.

U. appendiculata, (Pers.) Lév.

II and III. Spots yellowish and indefinite or none; sori amphigenous, scattered, pulverulent; confluent. II. Uredorsori yellowish-brown; uredospores sub-globose or oval, echinulate, 18–21 by 21–24 μ. III. Teleutosori blackish purple, teleutospores oval to sub-globose, with a prominent obtuse, hyaline apiculus, epispore thick, smooth, 18–24 by 27–32 μ; pedicels hyaline, fragile, 1½–2 times the length of the spore. On *Phaseolus vulgaris*, *P. diversifolius* and *P. helvolus*.

In Obs. Myc. 1, p. 17, Persoon describes *Uredo appendiculata* and in Syn. Fung. p. 221–222 repeated it with var. *phaseoli* and two other varieties. The latter have been referred to other species, leaving the original name for this form. But the name *Uromyces phasioli*, Pers., is frequently used.

U. œnotheræ, Burrill.

I. Inflected leaves somewhat involute or revolute; peridia irregularly scattered over both surfaces of the leaf, minute, short, roundish or slightly elongated, with a whitish, spreading or somewhat recurved, irregularly lacerated border; spores pale, globose angular, 15 μ in diameter. II. Spots red-purple, indefinite; sori epigenous, roundish, soon naked, brown; spores sub-globose, minutely echinulate, brown, 15–18 by 16–24 μ. III. Spots same; sori roundish or oblong, epigenous and soon naked or cauline and long covered by the epidermis, blackish; spores oval, elliptical or oblong, strongly thickened at the apex, broadly rounded or variously pointed, dark-brown, 16–18 by 24–30 μ; pedicels about one and a half times the length of the spore, often broad, tinted especially close to the spore. On *Œnothera linifolia*.

The æcidia occur on the cauline leaves, affecting all alike, but sparingly on the radical leaves; the uredo and teleutoforms are mostly confined to the radical leaves. The pedicels of the uredospores are frequently persistent.

U. spermacoces, (Schw.) Curt.

II and III. Amphigenous, on stems and leaves; spots none; sori numerous, scattered, very prominent, rounded, black, surrounded by the ruptured epidermis. II. Spores sub-globose, yellowish, very minutely warty, 21–25 by 22–27 μ. III. Spores subglobose, smooth, uniformly very dark colored, 24–27 by 30 μ; pedicels persistent, about 3–4 times the length of the spore. On stems and leaves of *Diodia teres*.

U. Rudbeckiæ, Arth. & Hol.

Hypophyllous; spots pale then brown or black, numerous, scattered; sori small, densely clustered, somewhat circinating, slightly raised, clusters plane; epidermis at length vanishing with no remains around the cinnamon colored sori; spores oblong-ovate, obtuse or obtusely pointed, pallid, about 12 by 20 μ; pedicel slender, hyaline, somewhat longer than the spore. On *Rudbeckia laciniata.*

The spots resemble some forms of *Puccinia asteris,* the leaf soon breaking away, leaving holes as if eaten by an insect.

U. Howei, Peck.

III. Spots none; sori hypogenous, scattered, indefinitely clustered, often confluent, surrounded by the remains of the ruptured epidermis, blackish purple; spores oval, or subglobose, warty, 18–21 by 21–25 μ; pedicels about twice the length of the spore, very fragile, breaking off, leaving a small portion attached to the spore, which therefore appears to be very short pediceled. On leaves of *Asclepias Cornuti, A. tuberosa* and *A. incarnata.*

The pedicels in this species very easily break away. (They are short and permanent in some specimens examined, as indicated by Peck, (30th Rpt. N. Y. State Mus. p. 75.) The minute roughness of the surface is indicative of an uredoform, but no other form has been found and these are certainly often produced very late in the season. On account of the deciduous pedicels Peck at first described the species under the generic name of *Trichobasis* (23d Rpt. N. Y. State Mus. [1873] p. 58), but (in 30th Rpt. [1878] p. 75) transferred it to *Uromyces,* where it doubtless belongs. Perhaps strictness would require the insertion of Pk. in parenthesis as authority. This is *Uromyces asclepiadis,* Cke. (Grevillea V. [1877] p. 152).

U. polygoni, (Pers.) Fckl.

I. Amphigenous. Spots minute, inconspicuous; æcidia few, irregularly collected in little groups, small, very short, the lacerated border scarcely recurved; spores subglobose or elliptical, epispore thin, tuberculate, 15–18 by 18–21 μ; spermogonia not found. II. Amphigenous: spots yellowish; sori small, scattered, rotund, somewhat elevated; spores subglobose, epispore thick, minutely roughened, 21 by 24 μ. III. Sori cauline, elongated, confluent, dark brown, prominent; spores oval, obovate oblong, obtuse, 15–24 by 21–35 μ; pedicels long, persistent, sometimes reaching 100 μ. On *Polygonum aviculare var. erectum* and *P. ramosissimum.*

The teleuto form occasionally occurs on the midribs of the leaves and even on the blade. In 1797 Persoon (Disp. Meth.) named this plant *Puccinia Polygoni,* but afterwards wrote *P. Polygoni Avicularie* (Syn. Fung. [1801], p. 227). Schroeter in 1869 (Rost u. Br. Pilze Schlesiens) adopted the name *Uromyces Avicularie.* Fuckel published in 1869 (Symb. Myc. p. 64) the name as *Uromyces Polygoni.*

U. euphorbiæ, C. & P.

II. and III. Amphigenous; spots purple or yellowish; sori scattered, round, small. II. Uredosori distinguished by their lighter brown color; spores globose, minutely roughened, pale brown, 15–21 μ. III. Teleutospores subglobose, oval or obovate, slightly apiculate, warty, 15–18 by 18–25 μ, and interspersed with numerous slender paraphyses; pedicels about twice the length of the spore, slender, hyaline, very fragile and deciduous, leaving a small portion attached to the spore. On leaves of *Euphorbia maculata*, *E. hypericifolia*, *E. dentata* and *E. heterophylla*.

The pedicels are deciduous, as are those of *U. Howei*, Peck, and the surface of the spore is similarly roughened. *Æcidium euphorbiæ*, Pers. accompanies the *Uromyces* in many cases, but it is believed by most botanists to have no connection with this species.

Uromyces caladii, (Schw.) Farlow.

I. Æcidia scattered over the whole under surface of the leaf, short, with a spreading border; spores subglobose to elliptical, angular, minutely roughened, 15–18 by 18–24 μ. Spermogonia, also hypophyllous, scattered, preceding and accompanying the æcidia. II. and III. Amphigenous; sori scattered, round or oblong, often remaining long covered by the epidermis, frequently confluent. II. Uredospores pyriform, truncate at the base, epispore thick, slightly thicker at the apex, conspicuously echinulate, 15–21 by 25–32 μ. III. Teleutospores oval, subglobose or pyriform, smooth, apiculate, 16–21 by 25–32 μ; pedicels about as long as the spores, very fragile and deciduous, leaving a small portion attached. On *Arisæma triphyllum*, *A. Dracontium* and *Peltandra Virginica*.

The following is the synonymy of this species:

Uredo Caladii. Schw. Syn. Fung. Car [1822] No. 480.

Cæoma (*Uredo*) *Ari Virginici*, Schw. Syn. N. Am. Fungi [1834] No. 2839.

Uromyces Peltandræ, Howe. Bull. Torr. Bot. Club. V. [1874] p. 43.

Uromyces Ari-Virginici, Howe. l.c. p. 43.

Uromyces Pontederiæ, Ger. l.c. VI. p. 31.

Uromyces Arisæmæ, Cke. l.c. p. 32. Also Hedw. XIV. [1875] p. 190.

Schweinitz was probably mistaken at first in his host plant, and means to correct this error by changing the specific name to *Ari Virginici.* in the N. Am. Fungi. His description in the latter work shows that his specimens were the teleutoform and priority requires the name *Uromyces caladii* (Schw.) as used by Farlow (Ellis' N. Am. Fungi No. 232 [1879].

U. pyriformis, Cke.

III. Spots none; sori amphigenous frequently arranged in an ellipse, elongated, very dark; spores pyriform, obtuse; epispore smooth, thickened at the apex, 15–20 by 25-32 μ; pedicels one-half as long as the spores, colored. On leaves of *Acorus Calamus.*

Mr. Peck remarks: "The species is very closely allied to *U. sparganii,* but appears to differ in habit." It is very doubtful whether it is distinct.

U. sparaganii, C. & P.

III. Spots inconspicuous or none; sori amphigenous, scattered or in elongated clusters, round or elongated, often confluent, dark brown, pulverulent; spores pyriform or oblong, apex rounded or truncate, epispore smooth, slightly thickened at the apex, 15–20 by 24–32 μ; pedicels colored, half to as long as the spore. On both sides of leaves of *Sparganium eurycarpum.*

U. erythronii, (DC.)

I. Spots purplish, inconspicuous; aecidia few, single or in small clusters or lines, short, with a narrow, delicate, wavy-lobed border; spores subglobose or oval, somewhat angular, smooth or obscurely roughened, 15–21 by 21–27 μ. III. Spots none, sori amphigenous few, scattered elliptical, usually remaining partly covered by the epidermis; teleutespores subglobose to oblong, apiculate, marked with longitudinal striæ, 15–21 by 20–30 μ; pedicels fragile, deciduous. On leaves of *Allium striatum.*

The only difference between the Illinois specimens and those on *Erythronium* from Europe is in the small number of peridia in a cluster.

U. junci, (Schw.) Tul.

II. and III. Sori amphigenous, scattered and sometimes confluent, roundish or elongated, prominent, long covered by the epidermis, and after the rupture of the latter its edges conspicuous, the uredorsori yellowish brown, the teleutosori dark brown, uredospores sub-globose, elliptical or sometimes pyriform, echinulate, 12–18 by 18–21 μ, occasionally longer; teleutospores clavate or irregularly elliptical, usually widest toward the top, smooth, apex obtuse, rounded or truncate, strongly thickened, deep brown; base narrowed, 14–18 by 21–32 μ; pedicel somewhat colored, nearly or quite as long as the spore. On *Juncus tenuis.*

The teleutosori are often much infested with *Darluca filum;* this seems especially true on *Juncus tenuis.*

U. scirpi, Burrill.

II. and III. Amphigeneous; spots brown, indeterminate; sori long covered by the epidermis, minute and rounded or larger and oblong, sometimes confluent end to end forming clusters up to one-fourth inch long, nearly black. II. Uredospores, among the teleutospores, few, irregularly elliptical, yellowish brown, sparsely echinulate, 15–20 by 27–36 μ. III. Teleutospores clavate-elliptical, widest at center, mostly pointed, brown, apex darker and thickened, about 18 by 32–42 μ; pedicel stout, sub-hyaline, about the length of the spore. On leaves of *Scirpus fluviatilis.*

The leaves are thickly mottled with conspicuous brown spots not definitely circumscribed.

U. acuminatus, Arthur. (Bull. Minn. Acad. Nat. Sc., Vol. XI, p. 35).

II. and III. Hypogenous; sori scattered, elongated, soon naked ruptured epidermis ragged, conspicuous; uredospores globose or oval, somewhat echinulate; teleutospores very irregular, sub-globose to clavate, sometimes rounded or truncate, but usually conspicuously and variously pointed; wall thin, smooth, yellowish brown, 15—18 by 24–39 μ; pedicel rather slender, somewhat colored, from one to three times length of spore. On leaves of *Spartina cynosuroides.*

Among the *Uromycetes* inhabiting grasses this is readily distinguished by the irregular and peculiar shape of the teleutospores. While some are longer than wide, many are oblong or nearly lanceolate, and the apex has a multitude of forms—straight, acutely acuminate, often turned sidewise, beak-like, not seldom double and occasionly suggesting the appendages at the apex of the teleutospores of *Puccinia coronata.*

U. graminicola, Burrill.

II. and III. Sori amphigenous, but more common on under surface, scattered, small, oblong or linear, soon uncovered, the ruptured epidermis ragged but usually plainly apparent; uredosori yellow, teleutosori blackish brown; uredospores spheroidal or oval, minutely echinulate, 15–18 by 18–22 μ; teleutospores variable, sub-globose oval or oblong, smooth, apex rounded or angular, thickened, 12–18 by 21–30 μ; pedicel somewhat colored, thick, scarcely tapering below, once to twice the length of the spore. On *Panicum virgatum* and *Elymus Virginicus.*

This species resembles somewhat closely *U. junci* (Schw.) Tul., from which however it is sufficiently distinct aside from the difference in host. Compared with the latter the present species has larger and earlier opened sori; the uredospores have finer echinulations and

the teleuto-pores are usually shorter, rounder, with apex less produced and pedicel very distinct, being thicker, longer and less tapering below. Among the *Uromyces* on grasses this seems distinct from *U. Peckianus*, Farlow, with which there is some resemblance. The latter has the teleutospores more nearly sub-globose, wall uniformly thickened and not produced at apex and with longer and different pedicels. Perhaps the nearest approach is to *U. spartinæ*, Farlow, which, however, has much larger and thicker-walled uredo-pores and the teleutospores are lighter colored, more regular in shape, with longer and more slender pedicels.

Genus PUCCINIA, Persoon.

(Tentam. Disp. Meth. p. 38).

Teleutospores two celled, one above the other, brown, produced on permanent pedicels which arise in dense masses from a cushion like layer of irregular cells beneath the epidermis.

The characteristics of the genera *Uromyces* and *Puccinia* are substantially identical: except that in the former the teleuto-spore consists of a single cell and in the latter of two cells formed by a horizontal septum usually placed somewhat below the middle. The uredo and æcidium forms of the two genera are not distinguishable. That the two genera are very closely allied is also shown from the fact that in some species of *Uromyces* two celled spores are met with: while especially when not fully nourished, single celled spores are quite common in certain *Puccinias*. Occasionally more than two cells are observed in true *Puccinia* spores, but in this case there is less difficulty in determining the classification, because the spores in genera (*Phragmidium* etc.), characterized by two or more transverse septa, are considerably different in appearance.

In exact strictness each cell in all these divided forms should be called a spore, for each is independent of the others in germination.

The genus has been divided as follows:

1. *Leptopuccinia*. Only teleutospores produced which are firmly attached to their stems and germinate soon after maturity: and quite firm, mostly half globular.

2. *Micropuccinia*. Only teleutospores known, these readily separating from the pedicels, germinating only after a long period of rest.

3. *Hemipuccinia*. Only uredo and teleutospores known (æcidia not known).

4. *Pucciniopsis*. Æcidia and teleutospores known (uredo wanting).

5. *Eupuccinia*. Æcidia, uredo and teleutospores known.

a. Autopuccinia. All sporeforms on the same plant.

b. Heteropuccinia. Æcidia (and spermogonia) on a different host species from the uredo and teleutospores.

The third division now undoubtedly contains many species which further information will transfer to the fifth, and the same may be said, with less probability, of the fourth. Since this classification is not applied in what follows, we cite as examples of the first: *P. anemones-virginianæ*, Schw.; *P. circeæ*, Pers.; *P. asteris*, Duby; of the second, none in the list known; of the third, *P. pruni-spinosæ*, Pers.; *P. scirpi*. DC.; *P. maydis*, Car.; of the fourth, *P. aculeata*, Schw.; of the fifth, first division, *P. tanaceti*, DC.; *P. flosculosorum*, Roehl.; *P. menthæ*, Pers.; second division, *P. caricis* (Schum.); *P. graminis*, Pers.

P. anemones-virginianæ, Schw.

III. Spots dark brown; sori hypophyllous, prominent, small, but commonly in dense wart-like clusters, dark brown; spores linear-oblong, obtuse, slightly constricted, light brown below, darker above, the upper cell shorter and with the epispore thickened at the apex, 12–15 by 35–55 μ; pedicels very short, colored. On leaves of *Anemone cylindrica* and *A. Virginiana*.

The spores are light colored and fragile, when dry much shrunken. Only teleutoform known.

Schweinitz first gave the name cited above (Syn. Fung. Car. [1822] p. 46) and afterward (N. Am. Fungi [1834] p. 296) changed N. to *P. solida*.

P. ranunculi, Seymour.

III. Amphigenous, but mostly epiphyllous. Sori irregularly associated, often crowded, but scarcely confluent, occupying large areas on the whole of the leaf surface, little elevated, circular, powdery, surrounded by the ruptured edges of the epidermis, æcidium-like, cinnamon brown; teleutospores broadly elliptical, usually, little or not at all constricted at the septum, ends rounded, vertex more, rarely furnished with a low, pale apiculus, thickly but minutely tuberculate, 18–24 by 22–39 μ; pedicel hyaline, fragile, short, sometimes more or less lateral. On *Ranunculus repens;* Riverside, Ill., near Chicago, June 2, 1883, J. C. Arthur.

The little warts of the epispore are scarcely or not at all visible in soaked specimens. The teleutospores sometimes germinate in the sorus in June. One celled specimens are not uncommon, and some vary widely from the described type.

P. podophylli, Schw.

I. Hypogenous, spots indefinite, mostly large, sometimes confluent over the whole leaf, yellow; æcidia densely crowded, very short, deeply and numerously split and much recurved, very fragile; æcidiospores subglobose or ell ptical, epispore very thin, minutely tuberculate, 16–27 μ; spermogonia minute, rather sparsely scattered, opposite the æcidia. II. Unknown. III. Amphigenous on

leaves and stems, on the former mostly beneath; sori small, rounded, usually more or less confluent; spores ovate, obovate or elliptical, beset with straight or curved, conspicuous spines, 20–27 by 39–48 μ; pedicel very delicate and fugacious. On *Podophyllum peltatum.*

The species is readily identified by the spines of the teleutospore. The æcidia occur on the parenchymatous portions of the leaf and the teleutospores are not unfrequently subsequently produced along the veins and upon the stems, leaving no apparent mycelial connection with the æcidia. In other cases they are produced either in the midst of the æcidia or in close proximity. Commonly known as *P. aculeata,* Schw.; but the above name has priority.

P. violæ, DC.

I, II and III. Amphigenous or often hypogenous; æcidia-spots definite or more or less diffused, sometimes covering large areas of the blades and of the petioles. I. Æcidia irregularly, usually densely clustered, short, rather coarsely and deeply lacerated and irregularly recurved; æcidiospores subglobose, epispore very thin, minutely tuberculate, 12–18 μ; spermogonia not found; (*Æcidium violæ,* Schum.). II and III. Uredo and teleutosori sparsely scattered or collected in little irregular groups upon discolored spots. II. Uredospores subglobose, elliptical or obovate, epispore, sharply echinulate, cinnamon-brown nearly as dark as the teleutospore, 18–24 μ. III. Teleutospores usually broadly elliptical, frequently irregular, little or not at all constricted at the septum, which is thick, vertex thickened, furnished with a conspicuous, tinted, usually obtuse apiculus, and a somewhat similar projection sometimes occurs on the side of the under segment near the septum, base mostly obtusely rounded, epispore rather thick, conspicuously but rather finely tuberculate, 18–24 by 26–37 μ; pedicels hyaline, fragile, sometimes more or less lateral, not longer than the spore. On *Viola cucullata., V. pubescens* and *V. striata.*

P. Mariæ-Wilsoni, Clinton.

I. Amphigenous; æcidia irregularly scattered, often closely associated over large areas of the host, peridia laciniated and excurved; æcidiospores, subglobose, epispore thin, finely echinulate, 15–18 M; spermogonia scattered among the æcidia. III. Teleutosori hypogenous, irregularly clustered, little elevated, long-covered by the epidermis; teleutospores irregular and various, more often elliptical, not constricted at septum, the latter strongly developed, apex obtuse, sometimes furnished with a very short apiculus, epispore thick, conspicuously though rather finely tuberculate, 21–27 by 30–48 μ; pedicel hyaline, fragile, short. On *Claytonia Virginica.* Both forms were collected at Riverside, Illinois, near Chicago, June 2, 1883, by J. C. Arthur.

This compound specific name ought not to be tolerated. Whatever may be said of the Schweinitzian and the old specific names composed of the binomial name of the host, there is no excuse in such

a case as the present for disregarding a well established and appropriate rule.

In the accessible descriptions nothing is said of the tuberculate surface of the teleutospore.

P. heterospora, B. & C.

III. Spots purple, definite: sori hypogenous, small, densely and definitely clustered, soon naked, epidermis inconspicuous; spores subglobose or rarely elongated, mostly single celled but frequently septate in any direction; epispore smooth, gradually thickened toward the apex, diameter 18–27 μ; pedicel hyaline, slender, diminishing below, about three to five times the length of the spore. On *Sida spinosa;* Union, Sept. 17, 1883, 5033 Coll. T. S. Earle.

This is *Uromyces pulcherrima*, B. & C. (Grev. III, p. 56, Dec. [1874;]) also *U. Thwaitesii*, B. & Br. (Journ. Linn. Soc. XIV., p. 92, [1875.])

The original description is by Berkeley and Curtis, (Jour. Linn. Soc. X, p. 356, [1869.]) See A. B. Seymour, Botanical Gazette, 1884, p. 351.

The species is properly a *Puccinia*, since the septate cells though usually less in number than the simple ones, are numerous and normal in character—evidently the highest development of the plant.

P. nolitangeris, Cda.

Hypophyllous. II and III. Sori minute, scattered, uredosori yellowish; teleutosori brown; uredospores subglobose, obscurely echinulate, diameter 16–19 μ; teleutospores elliptical to oval but irregular, rounded at both ends and slightly constricted, with a prominent hyaline apiculus, 15–18 by 25–33 μ; pedicels hyaline, very fragile and deciduous, apparently about as long as the spores. On leaves of *Impatiens fulva* and *I. pallida.*

This species has now been found for four successive years in the "Lower Park" at Deer Park, La Salle Co., though diligent search fails to discover it in any of the similar localities in that region, nor has it been found elsewhere in the State.

P. amorphæ, Curt.

II. Sori usually epiphyllous, small, few, clustered, surrounded by numerous, closely packed, clavate, incurved, brown paraphyses; spores ovate or oval, minutely echinulate, 12–15 by 18–21 μ. III. Amphigenous, sori small, scattered or above clustered and circinate; paraphyses as in II.; teleutospores much constricted, cells globose, enveloped by a thick, hyaline, readily separable coat, without latter 24–30 by 42–45 μ; pedicels hyaline, fragile. On leaves of *Amorpha fruticosta* and *A. canescens.*

This is *Uropyxis amorphæ*, Schroeter, but aside from the peculiar coating of the teleutospore there is nothing to separate the species from *Puccinia.* The uredoform would have been considered a good

Lecythia and is much like that of *Melampsora* on willows. The teleutosori on the upper side of the leaf are compact—the spores crowded together on the under side; the spores are diffusely associated in the sori.

P. pruni-spinosæ, Pers.

II and III. Hypophyllous. Spots above small, scattered or confluent, for II. yellow, for III. purple; sori scattered, small, rounded, teleutosori purplish brown; uredospores oblong or clavate-elliptical, smooth, 15–18 by 32–39 μ; paraphyses pedicel-like, then swollen at the end and often curved; teleutospores deeply constricted, the segments often globose, easily separable or more closely united and irregular, strongly echinulate, 21–24 by 24–39 μ; pedicels hyaline, very fragile, about the length of the spore; the paraphyses numerous, much enlarged above and brown. On leaves of *Prunus Americana*, *P. Virginiana* and *P. serotina*.

The uredoform is *Uromyces prunorum*, Fckl. The shape and attachment of the cells of the teleutospores varies on different hosts. On *Prunus Americana* the cells are nearly or quite globular and easily separable, while on *P. serotina* they are well joined and variable.

Nees (Syst. d. Pilze Schwämme 1816]) under the generic name of *Dicæoma*, separated the *Puccinia* species in which the spores spontaneously divided at the septum before germination. *P. pruni-spinosæ* belongs to this group.

P. Peckiana, Howe.

III. Hypogenous; sori small, scattered, few or many, sometimes sparingly confluent, cinnamon-brown, powdery; spores in one view more or less triangular, in the other at right angles to the first, elliptical, not constricted at segment, upper segment triangular with a small, hyaline, obtusely rounded apiculus, lower segment in side view somewhat quadrate with two basal projections, to one of which the pedicel is attached, and the other is terminated with a hyaline apiculus similar to that of the upper segment, 22–28 (base) by 36–45 μ; pedicel hyaline, fragile. On *Rubus villosus*: Urbana, July 24th, 1884, T. J. Burrill.

P. tiarellæ, B. & C.

III. Amphigenous, spots small, distinct, reddish-brown; sori scattered, circular, prominent, on the petioles more or less elongated and sometimes confluent, chestnut-brown, spores elliptical, constricted at the septum, vertex much thickened and usually prominently pointed, base mostly obtusely rounded, epispore rather thin, smooth, 12–18 by 21–36 μ; pedicel nearly hyaline, very slender, once to twice as long as the spore. On *Mitella diphylla*.

Thanks are due to Professor W. G. Farlow for the comparison of this with original specimens.

P. proserpinacæ, Farlow.

II and III. Amphigenous, but often only hypophyllous; sori rounded, scattered or collected in irregular groups, sometimes, especially along the veins, confluent, rarely naked, the uredosori surrounded by the remains of the ruptured epidermis, the two kinds nearly of the same color, chestnut-brown, the teleutosori becoming grayish from the germinating filaments; uredospores obovate, pale cinnamon colored; epispore rather thick, sharply echinulate, 15–21 by 24–30 μ; teleutospores oblong, sometimes narrower, usually gradually contracted at the septum, apex thickened and rounded or pointed, epispore thin, smooth, cell contents granular, pale brown, 15–21 by 35–52 μ; pedicel nearly hyaline, usually about half the length of the spore. On *Proserpinaca palustris*.

P. circææ, Pers.

III. Hypophyllous. Spots definite, purple or brown; sori rounded and clustered and more or less circinate; teleutospores oblong, slightly constricted, smooth, obtusely pointed, apex thickened, narrowed at base, 15–24 by 21–36 μ; pedicel somewhat colored, equaling or exceeding the length of spore. On *Circæa Lutetiana* and *C. alpina*.

On *Circæa Lutetiana* the sori are matted, while in *C. alpina* they are distinct, smaller and often circinate.

P. pimpinellæ, (Strauss) Lk.

II and III. Amphigenous. Sori rather large, round, scattered, soon naked; uredospores globose or ovate, minutely rounded, thick walled, 18–21 by 24–27 μ; teleutospores broad, ends rounded, little constricted, surface roughened with mesh-like depressions, 18–21 by 29–35 μ; pedicel hyaline, fragile, sometimes more or less lateral. On *Osmorrhiza longistylis* and *O. brevistylis*.

Peck (29th Rep. N. Y. State Mus. [1878] p. 73) mentions without describing *P. Osmorrhizæ*, C.&P., on *Osmorrhiza*. Previously (25th Rep. N. Y. State Mus. [1873] p. 112) he describes *P. Myrrhis*, Schw. (N. Am. Fung. [1834] p. 296) on the same host plants. Schrœter (Hedw. XIV [1875] p. 169) shows the latter to be the same as *P. Pimpinellæ*, Lk. (Spec. Plant. II, [1824-25] p. 77) Winter (Rabh. Kryptog. Fl. I [1882] p. 212) unites these two with *P. Chærophylli*, Purton (Brit. Plants III [1821] No. 1553) and other supposed species under the name *P. Pimpinellæ*, (Strauss). The above mentioned specimens, collected by Wolf, were identified by Peck as *P. Osmorrhizæ*, C.&P., but they agree with his description of *P. Myrrhis*, Schw. and with Thümen's specimens, including those of *P. Myrrhis*, Schw., (Mycoth. Univ. No. 1327) collected in New York by Gerard, and *P. Chærophylli*, Purton (Mycoth. Univ. No. 1229).

P. galiorum, Lk.

I. Æcidia hypophyllous, small, short, reflexed at summit; spores subglobose or broadly oval, smooth, 15–21 μ. II. (Not yet found in Illinois). III. Amphigenous; sori usually scattered singly on leaves and stems, round or somewhat elongated, teleutospores irregular, elongated, mostly oblong or clavate-elliptical, smooth, apex strongly thickened, obtuse or variously pointed, sometimes broadly truncate, usually narrowed to the base, 18–21 by 30–45 μ; pedicels hyaline, about the length of the spore.

Single celled teleutospores are rather commonly found. On *Galium concinnum* and *G. triflorum*.

P. tenuis, Burrill.

I. Hypophyllous, rarely also epiphyllous: æcidia clustered in little irregular groups or sparsely scattered, very small, short, the narrow border irregularly lacerated and recurved; spores subglobose, very minutely tuberculate, 14 to 18 μ. (*Ecidium tenue*, Schw.). III. Hypophyllous; spots small, often confluent, mostly yellow with a broad blackish center; sori sometimes scattered, usually confluent, effused, slightly convex, covered by the epidermis, dull grayish black; spores oblong-clavate, slightly constricted, usually angular or variously and conspicuously pointed, 15 by 40 μ; pedicels hyaline or slightly colored, half as long as the spore. On leaves of *Eupatorium ageratoides*.

P. kuhniæ, Schw.

II and III. Amphigenous; sori not prominent nor compact, often ragged from the uneven height of the spores. II. Uredospores with the teleutospores, sub-globose to oblong, echinulate, yellowish-brown, 16–27 by 27–30 μ. III. Teleutospores quite uniform, rounded at both ends, broad, with a very short, nearly hyaline apiculus and sometimes a similar projection on the side of the lower segment, thick walled, dark colored, smooth, 30 by 44 μ; pedicels as long as 90 μ. On *Kuhnia eupatorioides*.

P. conoclinii, Seymour.

II and III. Mostly hypophyllous; spots small, purple, often confluent over large areas, becoming pale; sori scattered, sparse or very numerously associated, not often confluent; uredosori cinnamon-brown; teleutosori dark reddish brown; uredospores sub-globose to oval, sharply echinulate, 18–27 μ; teleutospores broadly oval, little constricted, ends rounded, wall thick warty, 27 by 32-42 μ; pedicel nearly hyaline, firm, crooked, very long, about three times length of spores. On *Conoclinium cœlestinum*: Pine Hills, Union Co., Sept. 11, 1882. Coll. F. S. Earle.

This is *P. centaureæ*, DC. of Berkeley's notices of North American Fungi. Grevillea, III, p. 53, ascertained by examination of the original specimen in Herb. Curtis, but differs from other authentic specimens bearing this name.

P. asteris, Duby.

III. Hypophyllous; sori densely crowded in round, distinct and firm clusters, the latter scattered, few or many, light to dark brown; spores smooth, clavate, gradually rounded to the septum and toward the base, upper segment widest, apex thickened, rounded or pointed, 15–18 by 33–45 μ; pedicel nearly hyaline, usually somewhat shorter than the spore. On various species of *Aster*.

There is no apparent reason for keeping separate the variable forms known as *P. asteris*, Schw. and *P. Gerardii*, Peck. On *Aster sagittifolius* both are found on the same leaf in several instances. The younger, more rapidly grown specimens are lighter colored and there are all degrees of distinctness and confluence of the sori. When on thin leaves, the spots quickly die, the spores are very poorly developed, light colored, thin walled and very fragile. In other cases the sori are somewhat circinate in arrangement and not crowded. The central and older ones are covered with the epidermis, the outer, younger and lighter brown ones burst through and are thus naked. Sori very rarely occur on the upper side of the leaf. On *Aster Novæ-Angliæ* the spores are better developed, plumper, stronger, darker brown, yet on dead spots are the opposite. Here the sori are usually much scattered, not collected in clusters. Sometimes on thin leaves of several species, dead spots soon fall out, leaving more or less rounded holes.

Again Schweinitz's name (N. Am. Fungi [1831] p. 296) is untenable, having been previously used by Duby (Bot. Gall. [1828–30] p. 888). For this reason the name *P. Gerardii* much more recently given by Peck (24th Rep. N. Y. State Mus. [1870] p. 91) should be adopted if either. But there is a further question whether or not the American specimens are specifically distinct from those of Europe. Three names have been given to the latter: *P. asteris*, Duby, *P. tripolii*, Wallr, (Flora Crypt. Germ. [1831–3] II. p. 223), and *P. asteris* Fckl. (Symb. Mycol. [1875] p. 53), which have been pronounced synonyms by several botanists, and from the material and descriptions at hand it is impossible to separate from these the American forms. Schroeter (Hedw. XIV. [1875] p. 169), after an examination of original specimens, confidently decides that the forms are specifically identical. (Cooke Grevillea III. [1875] p. 180) seems to regard Schweinitz's species as distinct from the European plant, though not supposing *P. Gerardii*, Pk., specifically different from the former.

P. silphii, Schw.

III. Hypogenous; spots scabious, numerous, scattered, concave with a raised rim; sori very prominent, wart-like, compact, dull

grayish brown; spores irregular, oblong clavate, conspicously and angularly pointed, firm, dark colored but not thick walled; smooth, contents granular, 13 by 40 μ; pedicel tinted, firm, about the length of the spore. The leaves are often thickly spotted and scarred by the fungus, and large patches of sori occur also on the stems. On *Silphium terebinthinaceum*, *S. integrifolium* and *S. perfoliatum*.

P. xanthii, Schw.

III. Hypophyllous. Sori small, mostly closely clustered in spots or patches; spores smooth, oblong, evidently constricted, apex thickened, round or beak-like, 15–21 by 36–51 μ; pedicel slightly colored, usually shorter than spore. On leaves of *Ambrosia trifida* and *Xanthium strumarium*.

In the specimens on *Ambrosia*, the spores are somewhat thinner walled and more rounded than in those on *Xanthium*, but the difference is slight.

P. tanaceti, DC.

II and III. Amphigenous. Sori mostly rather large, scattered, often sprinkled over the entire leaf; uredospores globose to ovate, echinulate, 21–24 by 27–32 μ; teleutospores variable, broadly oblong to broadly oval with rounded ends, usually little constricted, smooth or sometimes warty toward the apex, the latter thickened or not 21–27 by 34–60 μ; pedicel hyaline, very long, two to four times the length of the spore. On various species of *Helianthus*.

Var. *vernoniæ*.

Amphigenous; spots small, purple with a pale yellow border or yellow only, sometimes indistinct; sori scattered, subrotund, prominent, blackish-brown or black; spores oblong-elliptical, mostly regularly rounded at the ends, slightly constricted, a central nucleus in each cell, 20 by 42 μ broad; peduncle hyaline, about four times as long as the spore; uredospores preceding or accompanying the teleutospores, not numerous, subglobose, sharply echinulate, about 25 μ in diameter. On *Vernonia fasciculata*.

Schweinitz (N. Am. Fungi. No. 2926) calls this form *P. Vernoniæ*, and describes it as follows: "Spots none; differing from *P. helianthi* in the rather large pulvinate sori and the delicate ferruginous color of the spores. It sometimes occurs also on species of Helianthus." But the gradation of forms between this and the typical *P. helianthi* leaves no sufficient ground for specific distinction. Further *P. helianthi* is very similar to *P. tanaceti*, DC. Winter (Rabh. Krypt. Fl. I, p. 209) unites it with the latter species, while Schroeter (Hedw. XIV, p. 180) maintains that they are distinct. The size, shape and color of the spores vary greatly, but are so connected by intermediate forms that no specific distinction can be founded on these characteristics. Cultures are necessary to determine this and similar questions.

P. flosculosorum, (Alb. & Schw.) Rœhl.

II and III. Amphigenous; sori small, scattered or in small clusters; uredospores subglobose sharply echinulate, mostly rather thick walled, 24–30 μ; teleutospores broadly elliptical or oval, constriction little or none, rarely thickened at the apex, usually furnished with punctiform to wart like projections, 18–25 by 30–45 μ; pedicels hyaline, fragile, not usually longer than the spore. On *Cirsium discolor*, *C. lanceolatum*, *Taraxacum dens-leonis* and *Hieracium Canadense*.

Under this species are included the forms that have been known on *Cirsium* as *P. cirsii*, Lasch. and *P. compositarum*, Schl., on *Taraxacum* as *P. variabilis*, Grev., and on *Hieracium* as *P. hieracii*, Mart. The teleutospores of American specimens are very minutely warty or apparently smooth, agreeing with Winter's remarks on this species in Hedwigia, XIX, p. 20. Nearly or quite all the specimens on *Cirsium* present both uredo and teleuto forms, but on *Taraxacum* teleutospores are found only in specimens collected late in the season.

P. maculosa, Schw.

III. Amphigenous; sori scattered or regularly collected in definite circinate clusters, often appearing on both sides of the leaf over the same area, cinnamon-brown; spores clavate-oblong, thin walled, fragile, smooth, much constricted, upper segment widest, apex thickened, rounded or variously pointed, base narrowed to the pedicel, 15–18 by 30–45 μ; pedicel hyaline, usually less in length than the spore. On *Cynthia Virginica*.

Schweinitz (Syn. Fungi, Am. Bor. p. 295, No. 2922) refers this species to *P. maculosa*, Strauss: but the latter is *P. prenanthis* (Schum.), and is very different from the present species.

P. lobeliæ, Gerard.

III. Mostly hypophyllous; sori small, scattered or irregularly and rather loosely clustered, cinnamon-brown; spores oblong, smooth, thin-walled, very deeply constricted, fragile, segments equal or the lower narrowed, 15–18 by 30–39 μ; pedicel very fragile, shorter than the spore. On *Lobelia syphilitica* and *S. puberula*.

This is *P. microsperma* B. & C. in Grevillea III, p. 55. The sori are more densely aggregated on *L. puberula*, but there is no other difference.

P. seymeriæ, Burrill.

III. Hypophyllous and on stems and calyces; spots definite, dark-colored, sori rather large, mostly crowded in conspicuous, circular clusters a fifth of an inch in diameter, these sometimes confluent,

dark-brown; spores elliptical or oval, little constricted, obtusely rounded at the ends, smooth, wall firm, brown, 15–21 by 30–36 μ; pedicel hyaline, broad, persistent, twice as long as the spore. On *Seymeria macrophylla.*

This is perhaps near *P. veronicæ* (Shum.), (*P. veronicarum* DC.), for while it differs in the size of the sori, the shape of the spores, and especially the stout, persistent pedicels, are similar. In the form of *P. veronicæ* with persistent pedicels, the spores are oblong to spindle-form, as well as furnished with a thickened apex.

P. lateripes, B. & R.

II and III. Amphigenous; sori usually round or angular, scattered or sometimes irregularly clustered; uredospores subglobose, strongly echinulate, 16–21 by 21–24 μ; teleutospores broadly oval, little constricted, ends surrounded, segments nearly equal, surface minutely roughened, 20–22 by 25–32 μ; pedicel hyaline, once or twice the length of the spore, usually more or less latterly produced. On *Ruellia ciliosa* and *R. strepens.*

This occurs on both sides of the leaf and also on the stem. Uredospores occur sparingly among the teleutospores. Those on *R. ciliosa* are globose, slightly echinulate, 22 μ in diameter, and the teleutospores 21–22 by 30–32 μ; the pedicels attain a length of 35 μ, but are easily broken. The uredospores on *R. strepens* are subglobose, 16–18 by 21 μ; the teleutospores are small, darker-colored and firmer, and the pedicel longer and less easily broken; size 19–21 by 25–28 μ; and the pedicels each a length of 75 μ.

P. menthæ, Pers.

I. Æcidia irregularly clustered upon dark-colored, more or less swollen spots on the stems or leaves, round or on the latter usually much elongated and often confluent, erect, short, irregularly split, not recurved; spores elliptical or ovate-oblong, minutely echinulate, 15–18 by 22–28 μ. II and III. Hypogenous; spots yellow or brown, often conspicuous, frequently confluent; sori scattered, round, rather large; uredosori yellowish-brown, flat; teleutosori blackish, prominent; uredospores subglobose or ovate, minutely echinulate, thin-walled, about 18–21 by 21–24 μ; teleutospores short; broadly ovate or broadly oval, somewhat constricted, ends rounded and furnished with a short, obtuse, almost hyaline apiculus, surface beset with minute, short warts, 21–27 μ; pedicel hyaline, once to twice the length of the spore. On leaves of *Mentha Canadensis, Mentha sp., Cunila Mariana, Pycnanthemum pilosum, P. lanceolatum, P. linifolium, Monarda fistulosa, M. Bradburiana, M. punctata, Blephilia hirsuta.*

The æcidium form is not usually present, but occurs on the same host with II and III, both of which are abundant. The American form differs from the European in having the teleutospores echinulate and has been called var. *Americana.* On *Blephilia hirsuta* the

parasite is plainly different from the type. The sori more frequently have a circular arrangement around one evidently older, the epidermis is later rupturing and afterwards is less apparent as a border; the spores are much lighter colored and the epispore is thinner. This is the uredoform. The teleutospores seem to be rarely developed.

P. glechomatis, DC.

III. Hypogenous: spots small, distinct, at first light-yellow, soon becoming blackish and breaking out, leaving more or less circular holes; sori usually closely clustered, often somewhat circinating, rarely scattered, ferruginous-brown: spores subelliptical, very variable, sometimes obtusely rounded but often conspicuously pointed above or below, oblong, elliptical, light colored, 18 by 31 μ; pedicel hyaline, fragile, nearly as long as the spore. On leaves of *Lophanthus nepetoides*.

This is *P. glechomæ*, D. C. (Fl. Fr. VI, p. 55), and *P. hyssopi*, Schw.

P. plumbaria, Peck.

III. Amphigenous; sori scattered on stems and leaves, small or large, sometimes confluent, covered until late with the more or less fissured and peculiar lead-colored epidermis, when naked dark reddish-brown, powdery; spores irregular, broad, mostly broadly ovate, obovate or elliptical, little constricted, apex usually slightly thickened or apiculate, smooth or minutely roughened, 21–25 by 32–50 μ, commonly about 39 μ long; pedicel hyaline, rather fragile, from less than one to one and a half times the length of the spore, sometimes more or less lateral. On *Phlox divaricata*.

The description by Peck is in the Botanical Gazette, June, 1881, p. 228, from specimens collected in Utah. During the same year, but believed to be later, Thümen sent out Century XXI of his Mycotheca Universalis, containing with number 32 a description with specimens from Idaho, on *Gilia* under the name of *P. Wilcoxiana*. By comparison of authentic specimens these prove to be specifically indistinguishable, as are those of Ellis' North American Fungi, number 1044; however, the latter bears the varietal name of *phlogina*.

The last has a different unclear spot in each segment, and the epispore is more distinctly roughened. The Illinois specimens on Phlox are very nearly smooth and do not have this round segmental spot, hence are more like the typical specimens of Peck in these respects. They are somewhat more irregular in shape than any of the others and the pedicel is more often obliquely produced.

P. convolvuli, Cast.

I. Hypogenous; spots small, distinct or sparingly confluent, brown; æcidia irregularly clustered or sometimes sub-circinate, short, small, pseudoperidium fragile, becoming powdery soon after opening;

spores subglobose or elliptical, epispore thin, tuberculate, 16–18 by 18–25 μ; spermogonia few, central, above. (*Æcidium calystegiæ*, Desm. *Ædubium*, Clint.) II and III. Amphigenous, more common beneath; sori rounded or angular, long covered by the epidermis; uredosori light brown, naked; teleutosori black; uredospores subglobose, finely echinulate, 18–21 by 21–30 μ; teleutospores clavate-obovate, constricted, obtusely rounded above but sometimes having a thickened and angular apex, narrowed below to the thick pedicel, smooth, 22–27 by 42–54 μ; pedicel stout, colored, shorter than the spore. On leaves of *Calystegia sepium*.

While covered by the epidermis, the sori have a livid hue, and this condition usually lasts sometime.

P. gentianæ (Strauss), Lk.

II and III. Epiphyllous or amphigenous; spots none, sori scattered, often rather large, long or even persistently covered by the epidermis; uredospores subglobose or oval, sharply echinulate, thick walled, rather dark brown, 18–24 by 21–27 μ; teleutospores very broadly oval, sometimes almost subglobose, little constricted, apex slightly thickened or somewhat apiculate, each segment often showing a small nuclear spot, smooth, 21–30 by 30–37 μ; pedicel hyaline, fragile, usually crooked, about twice the length of the spore. On *Gentiana puberula*.

The teleutospores are quite often single celled.

P. polygoni-amphibii, Pers.

II and III. Amphigenous; sori small, round or angular, in a circle about a larger sorus or irregularly collected in small clusters, long covered by the epidermis, often very numerous; uredospores subglobose or oval, sharply echinulate, 18–22 by 21–27 μ; teleutospores clavate or clavate-obovate, constricted, apex more or less strongly thickened, truncate, obtuse or variously pointed, narrowed below to the rather thick pedicel, smooth, wall rather thin; 12–21 by 33–54 μ; pedicel somewhat colored, short, half the length of the spore. On leaves of *Polygonum amphibium* and *P. Virginianum*.

The pedicels of the uredospores are long and appear in the sori of both states like paraphyses, but the teleutosorus not following in a uredosorus, has none of them.

There is some question about the identity of the *Puccinia* on *Polygonum Virginianum*. The sori are similar, but the teleutospores are more irregular in shape, the apex more commonly truncate, the epispore thinner and the cell contents of different appearance. But there does not seem to be sufficient reason to separate this as a species or even named variety.

P. aletridis, B. & C.

II and III. Amphigenous; sori rather small, scattered, often very numerous; uredosori somewhat prominent, powdery, cinnamon-brown; teleutosori little raised, long, covered by epidermis, blackish;

uredospores subglobose or oval, sharply echinulate, wall thick, 18–24 by 21–27 μ; teleutospores clavate, oblong or elliptical, abruptly and rather deeply constricted; apex thickened and mostly narrowed to a rounded point, lower segment usually longer and narrowed to the pedicel, surface smooth, 12–21 by 30–50 μ; pedicel hyaline, usually less than the length of the spore, but sometimes longer. On *Aletris farinosa*: Millers, Indiana, near the Illinois line, July 4th, 1882. Coll. E. J. Hill. It probably occurs in Illinois.

P. smilacis, Schw.

II and III. Hypogenous; spots small, numerous, brick-red; sori scattered or irregularly circinate, punctiform or elongated, surrounded by the ruptured epidermis and by a row of short, club-shaped paraphyses. II. Uredospores oval, slightly echinulate, pale, 21–27 μ, on fragile pedicels. III. Teleutospores broadly elliptical, conspicuously constricted, upper segment considerably rounded or obtusely pointed, often narrowing below to the pedicel, dark colored, smooth, 21 by 35–42 μ; pedicel thick, tinted, as long as the lower segment. On leaves of *Smilax hispida*.

P. caricis, (Schum.) Rebent.

II and III. Hypogenous; sori more or less elongated, variable, scattered, often very numerous and conspicuous, the ruptured epidermis ragged and long adherent; uredosori cinnamon-brown, teleutosori black; uredospores globose, subglobose or sometimes elongated, conspicuously but not sharply echinulate, 18–24 by 21–27 μ; teleutospores cuneate, little constricted, much thickened, obtusely rounded or almost truncate above and narrowed to the pedicel, smooth, 15–20 by 33–45 μ; pedicel hyaline or nearly so, one-half to once the length of the spore.

On *Carex sps.* and *Dulichium spathaceum*. *Uredo Caricis*, Schum. (Enum. Plant. Sæll, II. [1803] p. 231), *P. caricina*, DC. (Fl. Franc. VI. [1815] p. 60).

On *Dulichium spathaceum* the uredospores are smaller and often elliptical to oblong, 12–15 by 15–21 μ; the teleutospores are variable, more often truncate.

P. obtecta, Peck.

II and III. Amphigenous; sori scattered or irregularly clustered, often crowded, oblong, or more or less circular, long covered by the epidermis which at length becomes simply cracked or raggedly torn; uredospores elliptical or obovate-oblong, wall rather thick, minutely echinulate, 15–20 by 21–30 μ; teleutospores elliptical, somewhat constricted, apex thickened, obtusely rounded or variously produced and

pointed, usually narrowed below, often without septum, smooth, 18–20 by 45–60 μ; pedicel short, not usually more than half the length of the spore, deeply tinted. On *Scirpus validus.*

P. angustata, Peck.

III. Hypogenous; sori oblong or linear often arranged in long parallel rows or confluent in long lines, blackish, the remains of the ruptured epidermis persistent; uredospores subglobose to elliptical, thin-walled, sharply echinulate, 16–21 by 21–30 μ; teleutospores narrow, clavate or elongate-parallel, somewhat constricted, apex much thickened, often beak-like, narrowed below to and with the pedicel, 15–21 by 45–60 μ; pedicel colored, less than one-half to once the length of the spore. On leaves of *Scirpus atrovirens.*

P. windsoriæ, Schw.

II and III. Hypogenous, occasionally somewhat amphigenous; sori small, little elevated, irregularly scattered, very numerous, sparingly confluent, linear or oblong, soon naked, the ruptured epidermis scarcely evident; uredospores subglobose or obovate, epispore medium thick, sharply echinulate, rather deep brown, 18–24 μ; teleutospore broadly elliptical or obovate, slightly or not at all constricted at the septum, mostly obtusely rounded at the ends, upper segment mostly larger, vertex slightly thickened, smooth, 18–21 by 27–39 μ; pedicel about the length of the spore, stout, rather deeply colored. On *Muhlenbergia.*

P. graminis, Pers.

I. Hypogenous; spots definite, usually small, purple, somewhat thickened, æcidia crowded irregularly, or sometimes circinate, short, border narrow, numerously lacerated, little recurved; æcidia spores subglobose or angular, epispore thin, minutely tuberculate, contents finely granular, 11–15 μ; spermogonia minutely clustered, not usually numerous, opposite the æcidia. II. Amphigenous; sori linear, on the leaves short and scattered, on the leaf sheathes often confluent in long lines, orange-yellow; spores narrowly obovate or elliptical; epispore thick, strongly echinulate, 18–31 by 27–36 μ. III. Sori linear to elliptical, often confluent in long lines, mostly on the leaf sheathes, rather prominent, soon naked, black; spores clavate or narrowly elliptical, mostly somewhat constricted, vertex strongly thickened, more or less pointed, sometimes rounded, narrowed below to the pedicel, smooth, chestnut-brown, 15–21 by 36–60 μ; pedicel, firm, colored, about the length of the spore or shorter. On the culms, sheathes and leaves of cereals and grasses. In this collection on wheat, oats, *Agrostis vulgaris* and *Hordeum jubatum.*

As here identified a variable species, though some of the forms, often formerly included, are specifically separated under the names *P. cmaculata, P. windsoriæ* and *P. andropogi.* The description is

made from specimens on wheat. On *Agrostis* the teleutospores are sometimes nearly typical, in other cases they vary much in shape and thickness of the epispore, shorter, rounder and thinner for the most part. The uredo is very characteristic in all.

P. phragmitis, (Schum.) Kornicke.

II and III. Amphigenous; sori scattered, very prominent, mostly rather large, elliptical, somewhat powdery, soon naked, the ruptured remains of the epidermis not usually visible; uredospores elliptical, epispore very thick, strongly tuberculate, without paraphyses, 18–21 by 27–31 μ; teleutespores oblong, smooth, pale brown, somewhat but not abruptly constricted, vertex a little thickened and rounded or obtusely pointed, 18–22 by 37–60 μ; pedicel very long, three to four times the length of the spore, firm but rather slender, very slightly tinted. On *Spartina cynosuroides, Phragmites communis* and *Andropogon furcatus.*

The Illinois specimens on *Phragmites communis* have the teleutospores narrowed and more constricted so that the segments are each about elliptical, while European specimens on same host (Rabh. Herb. Mycolog. 282) are much like the Illinois specimens on *Spartina cynosuroides* and *Andropogon*; but in specimens on one *Spartina* the spore more closely resembles the Illinois *Phragmites* form.

This species was first described as *Uredo Phragmitis* by Schumacher (Enum. plant, Sæll. II. [1803] p. 231), and his description shows that his uredo was that of this species, if indeed he had not the teleutoform. Hedwig next described it as *Puccinia arundinacea,* which description was published by DeCandolle, together with one of his own in Lam. Encyc. Bot. (1806) p. 250, and it is explained by this why DC. is sometimes written as authority for the name instead of Hedw. Schweinitz (Syn. Fung. Car [1822] No. 187) published it under the name of *Puccinia arundinariæ.*

P. rubigo-vera, (DC.) Wint.

II and III. Amphigenous, mostly hypogenous; uredosori linear or oblong, irregularly scattered, seldom confluent, somewhat elevated, soon open; teleutosori linear or oblong, scattered or variously confluent, long covered by the unbroken epidermis, black, surrounded by a dense row of dark-brown paraphyses; uredospores subglobose, epispore rather thin, minutely echinulate, 21–25 μ; teleutospores cuniform, oblong or elliptical, constricted or not at the septum, but usually tapering below, vertex thickened, truncate, obtusely rounded or sometimes more or less pointed, epispore thin, smooth, cell-contents granular, 12–18 by 27–54 μ; pedicel short, rarely half the length of the spore, deeply tinted. On *Wheat, Oats, Rye* and *Elymus Virginicus.*

This name is founded upon the recognition of the uredoform as *Uredo rubigo-vera,* DC. (Flore Franc. VI. [1815] p. 83), which to say the least is doubtful. The same name has been used for the uredoform of *Puccinia coronata and of Puccinia graminis* found on the

same host species, and doubtless included by DeCandolle in his supposed species. Winter (*Die Pilze*, p. 217) probably had good reasons for accepting the name as here given, but should for any reason botanists decline to follow him in this, then *Puccinia striaformis*, Westd. (*Bull de l'Acad. Belg.* [1853] XXI.), rather than *Puccinia straminis*, Fckl. (*Enumer. Fung.* in *Jahr. Ver. J. Natur v. Nassau* [1861] etc.) should be adopted, though the latter recognizes DeCandolle's *Uredo rubigo-vera*, as the early stage of the teleutoform named by him. Certain it is that *P. coronata*, and *P. rubigo-vera* are very closely allied.

P. coronata, Corda.

II and III. Amphigenous; uredospores subglobose, echinulate, 18–21 by 21–24 μ; teleutosori small, oblong or linear, slightly raised, surrounded by a dense row of paraphyses, long covered by the epidermis; teleutospores cuneate, scarcely constricted at the septum, more or less truncate above, crowned with one to several conspicuous, obtuse, horn-like projections; epispore thin, smooth, cell-contents granular, 15–18 by 45–55 μ; pedicel short, less than half the length of the spore, rather fragile. On leaves and sheathes of *Oats* and *Wheat*.

This species is certainly related to *Puccinia rubigo-vera*. Indeed it is scarcely possible to separate them except by the terminal projections of the teleutospores in *P. coronata*, and these are present in varying degrees, sometimes nearly wanting.

P. emaculata, Schw.

II and III. Amphigenous, mostly epigenous; sori small, rather prominent, mostly very numerous, irregularly scattered or crowded, rarely confluent on the leaves, but on the sheathes forming long irregular lines, black, rather early erumpent but long surrounded by the ruptured epidermis; uredospores subglobose, epispore rather thin, sharply but minutely echinulate, 18–24 μ; teleutospores elliptical or broadly clavate, slightly constricted, vertex strongly thickened, obtusely rounded or pointed, narrowed below, smooth, not deeply colored, 15–21 by 30–48 μ; pedicel once to once and a half times the length of the spore, tinted. On *Tricuspis seslerioides*, *Eragrostis pectinacea*, *Panicum capillare* and *P. virgatum*.

On *Panicum virgatum* the teleutospores have in each segment a small circular nuclear spot and the pedicels are nearly colorless. On *Tricuspis seslerioides* and *Eragrostis pectinacea* the sori are mostly hypophyllous and the teleutospores are often lighter colored with quite hyaline pedicels.

P. flaccida, B. & Br.

Amphigenous; sori small, oblong to linear, often confluent, at length rupturing the epidermis, reddish-ferruginous; uredospores varying from elliptical to subglobose, the latter about 25 μ, furnished

with two or more hyaline points (germinal pores?), sharply echinulate, cinnamon-colored, teleutospores exceedingly variable, often undivided, the septum when present transverse, oblique or longitudinal, equally and in every degree unequally dividing the spore, the simple ones are usually clavate, the divided ones vary from clavate to spheroidal, regularly formed or much constricted and lobed with one or two thickened apical points, length about 30–40 μ, lighter colored than the uredo; pedicel hyaline once or twice the length of spore. On *Panicum crus-galli*.

A most peculiar species. From two-thirds to three-fourths or more of the teleutospores are septate presenting the most varying and aberrnat forms. So far as we are informed this has not been previously found in America, but a comparison with specimens kindly furnished by Dr. M. C. Cooke, of *Puccinia flaccida*, B. & Br., from Ceylon, leaves no doubt of the specific identity. The American specimens only differ in possessing more undivided and upon the average narrower teleutospores with somewhat thicker pedicels.

P. andropogi, Schw.

II and III. Hypophyllous; sori rather small, usually very numerous, elliptical, sometimes confluent in small, elongated groups, soon naked, surrounded by the remains of the lacerated epidermis; uredospores subglobose, epispore rather thick, tuberculate, 21–30 μ; teleutospores mostly obovate but varying to elliptical or clavate, slightly constricted at the septum, usually thickened at the vertex, obtusely rounded or sometimes short pointed, smooth, dark-brown, 15–22 by 30–45 μ; pedicel usually about the length of the spore, sometimes longer, more or less tinted. On *Andropogon furcatus* and *A. scoparius*.

In Thümen's Mycotheca Universalis, number 1336, the specimen named *Puccinia Ellisiana*, Thüm., which Farlow (Proceedings Am. Acad. Arts and Sciences, Vol. XII, (July, 1883) p. 81) identifies as *P. andropogi*, Schw.; the teleutospores are more often narrower and pointed, are lighter in color and the pedicels are longer than in the Illinois specimens. Still there can be no question as to the specific identity of the plants herein enumerated.

The uredospore seems to vary considerably, even in the same specimens as well as upon different host plants.

P. maydis, Carradori.

II and III. Amphigenous; sori sub-circular to oblong; irregularly scattered, often confluent, rather tardily rupturing the epidermis whose upturned edges persistently remain; uredospores subglobose, epispore rather thick, echinulate, 25–30 μ; teleutospore broadly elliptical, considerably constricted at the septum, ends mostly obtusely rounded, but sometimes thickened at the apex and variously

pointed, smooth, 15–22 by 30–45 μ; pedicel slightly colored, once to twice the length of the spore. On leaves of *Zea Mays*.

This is *Puccinia Sorghi*, Schw., (N. A. Fungi [1834] p. 295). The above name was published in 1815 (see Rabh's Krypt Fl. I, p. 186.)

Genus PHRAGMIDIUM, Link.

Teleutospores divided by two or more horizontal septa, producing three or more cells in a vertical row, teleutosori prominent, usually small, tufted, sometimes confluent in patches, uredospores one-celled, borne on deciduous pedicels; æcidiospores produced in vertical chains as in the true æcidia; uredo and æcidiosori surrounded by a thick row of club-shaped or more or less capitate incurved paraphyses.

All the spore forms of the *Phragmidia* are ordinarily hypophyllous, the æcidium and uredo forms appearing rather early in summer and the teleuto form after the first of July, but the two latter are very commonly found together during the later part of the season. Sometimes the fungi are seated upon the petioles and stems of the host. All grow upon species of *Rosaceæ* and so far as discovered upon plants of the genera *Potentilla*, *Rubus* and *Rosa*.

The æcidium forms have only recently been distinguished from the uredo, the sori of the two stages being mostly very similar and determined by the manner of the production of the spore, as just indicated. It is somewhat remarkable that in the æcidia stage there is no peridium, hence according to the characteristics adopted in this paper the genus form is *Cæoma*, not *Uredo* or *Æcidium*.

P. fragariæ, (DC.) Rossm.

II and III. Hypogenous; uredosori small, circular, without paraphyses, scattered; uredospores elliptical or obovate, echinulate each borne upon a pedicel 14-16 by 16-21 μ; teleutosori scattered, rather large, circular, prominent, powdery, chestnut brown; teleutospores usually three-celled, sometimes two, more often four-celled, oblong or broadly lavate, somewhat constricted at the septa, vertex slightly thickened, obtusely rounded, narrowed toward the base, epispore thin, smooth, 21-27 by 36-90 μ; pedicel hyaline, tapering below from one-third to one-half the length of the spore. On leaves of *Potentilla canadensis*.

This is *Phragmidium biarticulatum*, B. & C. but there is little reason to consider the American specimens specifically distinct from the European *Ph. fragariæ*, according to Winter's description. (*Die Pilze*, p. 228), and the specimens in Rabh. Herb. Myc. 281. On neither the latter nor the Illinois specimens was there observed any roughness of the epispore.

P. mucronatum, (Pers.) Lk.

I, II and III. Æcidia amphigenous, on the leaves more commonly hypophyllous and of different sizes, usually in little groups on a distinct reddish, yellow bordered spot, on the large veins, petioles and young stems confluent and swollen, conspicuous, causing more or less distortion of the host, surrounded by clavate, incurved, colored paraphyses, bright-orange colored; æcidiospores subglobose or angular, produced in erect chains, becoming rough-warty toward maturity, 18–24 μ; uredosori hypophyllous, small, scattered, mostly very numerous, sometimes sparingly confluent, surrounded by many incurved, clavate, colorless paraphyses, yellow; uredospores subglobose, rough-warty produced on a pedicel, 18 μ; telentosori hypophyllous, scattered, small, powdery, brownish-black; teleutospores cylindrical or oblong-elliptical, vertex narrowed and mucronate, apiculus hyaline, six to eleven septate, rather coarsely tuberculate, 24 by 65-77 μ; pedicel about one and a half times the length of the spore, mostly hyaline, swollen and elongate elliptical from above the middle downward. On *Roses*.

The supposed æcidium form described above (referred to under *Phr. speciosum*) occurs at the same time in mid summer, on the leaves with the uredo and teleutospores. The paraphyses are identical in the forms I and II and persist with the teleutoform.

Persoon's name (Disp. meth. [1797] p. 38) for this plant is *Puccinia mucronata* var. *Rosæ*. As the other variety has been given another name, this should bear the name of the species rather than of the variety. Link introduced (Spec. Plant. II., [1824–25] p. 84) the genus *Phragmidium* in which this species is included, hence *Phr. mucronatum* Lk., is often written.

P. speciosum, Fr.

III. On the stems and less commonly on the petioles, forming swollen distorted areas of more or less extent; sori irregularly confluent, grayish-brown, on year-old stems crust-like; spores cylindrical-oblong, about five to seven celled, sometimes less, scarcely or not at all constricted at the septa, ends rounded, apex mucronate, smooth, black, 30 by 60–90 μ; pedicel hyaline below, tinted above, tapering downward, very long, attaining seven or more times the length of the spore. On *Rosa*.

What has been called *Uredo miniata*, Pers., *Cæoma miniatum*, Sæhl., or *Colesosporium miniatum*, Lév., has been considered the æcidium form of *Phragmidium mucronatum*, Pers., with which it is certainly often associated. But it is very commonly found on the green leaves in the early part of the season, with *Phragmidium subcorticium* on the twigs at the same time. Sometimes, however, the teleutospores of *Phr. mucronatum* occur later in the season on the *Cæoma* affected leaves or other leaves of the same plant.

P. rubi-idæi, (Pers.) Wint.

II and III. Hypophyllous: uredosori small, scattered, usually very numerous; uredospores obovate or elliptical, epispore thin, sharply echinulate, 15 18 μ; teleutosori small, scattered, powdery, black; teleutospores cylindrical, ends obtusely rounded, vertex furnished with a more or less elongated, conical or often somewhat cylindrical hyaline apiculus, whole surface very rough-warty, almost black, about six to eight septate, 27 33 by 62 120 μ; pedicel tinted near the spore, otherwise hyaline, about one and one-half times the length of the spore, from above the middle downward elongate-elliptical, roughened. On leaves of *Rubus strigosus.*

The teleutosori are surrounded by many incurved colorless (in dry specimens) clavate paraphyses, but a careful examination of the specimens failed to reveal them with the uredosori, though these were over-mature and the spores everywhere scattered among the matted hairs of the leaf.

P. rubi, (Pers.) Wint.

II and III. Hypophyllous; sori very small, scattered; uredosori often very numerous, circular, orange-yellow, without paraphyses; uredospores ovate or elliptical, each borne upon a pedicel, epispore thin, finely echinulate, 12 15 by 15–20 μ; teleutosori rounded, sometimes confluent, black; teleutospores about 4 to 5 septate, cylindrical, sometimes constricted at the septa, ends obtusely rounded, the vertex furnished with a conical, more or less deeply tinted apiculus, surface finely tuberculate, sometimes appearing smooth, dark-brown, 35 by 100 μ; pedicel about as long as the spore or somewhat longer, very much smaller in the lower half. On *Rubus villosus.*

Genus TRIPHRAGMIUM, Link.

Teleutospores dark-brown, three-celled, triangular, the dividing septa vertical and horizontal or oblique.

In this genus no æcidiumform has been found, though spermogonia exist with the uredo. The species are easily recognized, but they are comparatively few; none, so far, found in Illinois.

Genus RAVENELIA, Berkeley.

Teleutospores many celled, berry-like, with vertical and horizontal septa, usually with a series of hyaline cells at base, pedicellate or sessile.

This curious genus is comparatively little known, and its standing among the *Uredineæ* has not been firmly established. It seems the germination of the spores has not been observed, neither have other

spore forms been certainly found as genetic productions. In *R. stictica*, B. & Br., however, Berkeley says: "The larger pseudospores are accompanied by uredinoid bodies which are minutely papillate." (Linn. Soc. Jour. Bot. Vol. XIV, p. 93.)

The spores attain the largest size among the *Uredineæ*, and are otherwise very readily generically recognized.

Speaking of *R. indica*, Berkeley says: "The glandular bodies consist of a large umbrella shaped dark cap, often 1-250th of an inch across, composed of a number of closely packed cells, supported by a long, hyaline, delicate, and apparently compound stem, round the end of which are suspended a circle of elongated hyaline bodies, calling to mind, in point of arrangement, the appendages of some species of *Medusæ*, or in general appearance the fruit of some *Marchantia*. In the South Carolina species (*R. glandulosa* B. & C.) on the contrary, the peduncle is shorter and the appendages are united by their sides into a solid mass."

The species grow on various *Leguminosæ*.

R. glandulæformis, B. & C.

Amphigenous. Sori scatter rather small, but often confluent in areas of variable, sometimes of considerable size, brown; spores broadly capitate, the many celled, disk-like, chestnut-brown upper layer projecting over the hyaline cells beneath, about 75 to 100 μ; pedicel short, hyaline.

Spores urnshaped, with a short pedicel, hyaline below and lobed or striate; even above, cellular, colored, projecting beyond the lower division. In some specimens the lower division is even, and the cells of the upper part larger, but it is probably a mere form.—Berkeley. Grev. III, p. 56.

On *Tephrosia Virginiana* "Pine Hills," Union county. Collected several times in same locality by F. S. Earle.

Genus GYMNOSPORANGIUM, DC.

Spores with one horizontal septum, less commonly one to six cells in a vertical row, yellow, with epispore thin, on long, slender, hyaline pedicels, imbedded in gelatine, which, when moist, swells into a soft columnar or irregular body. Parasitic on the leaves and branches of various *Cupressineæ*.

The species now assigned to this genus were formerly separated and a part of them, having the gelatinous material more or less columnar, made to form the genus *Podisoma*. The distinction is not properly generic, and at present most mycologists unite all the species under the generic name of *Gymnosporangium*. The European species agree in the spores having a single septum and this is usually made a characteristic of the genus, but some of the American species, otherwise similar, have from one to six-celled spores so that the description of the genus is necessarily extended to include them. The spores are produced in the spring instead of in the autumnal months, as are the teleutospores of most *Uredineæ*; but they germinate in May and June, hence have not a long period

of rest. The promycelium is rapidly formed under the proper conditions from the mature spores, and sporidia are abundantly produced. These latter are believed to develop only on species of *Pomæ*, and produce the æcidial growths included under the so-called genus *Roestelia*. This alternation of growth has been several times experimentally shown, but for the purposes of this paper the æcidial forms are given by themselves. The mycelium of the teleutosporic form is sometimes annual, but more often perennial and produces remarkable gall-like distortions upon the host.

"Spores yellow or orange colored, usually two-celled, occasionally one to six-celled, on long, hyaline pedicels, imbedded in a mass of jelly which, when moistened, swells into columnar or irregularly expanded masses. Mycelium parasitic in the leaves and branches of different *Cupressineæ*, producing in them various distortions." (Farlow, Gymnosporangia of the U. S., p. 8.)

G. macropus, Lk.

Sporiferous masses aggregated in globose tufts, surrounded at the base by a ring formed by the raised epidermis and subepidermal tissue of the host-plant, orange-yellow, cylindrical, acuminate, half an inch to an inch long, or at times longer; spores ovate-acute, two-celled, generally constricted at the septum and with a papilla at the apex, 15–20 broad by 45–60 long; mycelium annual, producing globose or reniform knots in the smaller branches. On leaves and smaller branches of *Juniperus Virginiana*. (Farlow, Gymnosporangia of the U. S., p. 13.)

Genus CRONARTIUM, Fries.

Teleutospores one-celled, without pedicels, compacted in an erect (often curved or bent) cylindrical, solid column; uredospores produced on pedicels, the uredosorus covered by a pseudo-parenchymatous membrane.

The peculiar column, composed of the elongated teleutospores adhering closely to each other, and rising conspicuously from the substratum, clearly designates this genus. The uredospores and teleutospores, so far as is known, are produced on the same host, sometimes in the same sorus.

C. asclepiadium, Kze., var. *thesii*, Berk.

II and III. Uredosori small, scattered or collected in irregular groups, furnished with a peridium; uredospores subglobose to elliptical, echinulate, 15 by 18–26 μ; teleutosori scattered, often numerous, column long, cylindrical, mostly curved, teleutospores cylindrical or oblong, yellowish brown, smooth about 11 μ. On *Comandra umbellata*.

This is *Cronartium comandræ*, Pk. (Bot. Gaz. IV, p. 128.)

Genus MELAMPSORA, Cast.

Teleutospores one or more celled, when divided, the septa mostly vertical, sometimes horizontal or oblique, sessile, densely compacted in a firm, flat or slightly convex layer; uredospores single-celled, sessile upon the hymenium, the sori usually covered by a membrane which is finally irregularly ruptured.

This genus, as here defined, includes not only what has been uniformly assigned to it, but the species which have been by different authors assigned to *Calyptospora*, *Melampsorella*, *Phragmospora* *Thekopsora*. Admitting all these as genera of equal rank, the characteristics may be given as follows:

Teleutospores produced beneath the cells of the epidermis.
  Teleutospores one-celled.....Melampsora.
  Teleutospores divided.....Phragmopsora.

Teleutospores produced in the cells of the epidermis.
  Teleutospores one-celled, colorless ..... Melampsorella.
  Teleutospores divided, colored—
    Sori small, with uredo.....Thekopsora.
    Sori broadly confluent or effused, without uredo—Calyptospora.

With the single exception of *Melampsora Goeppertiana* (*Calyptospora Goeppertiana*, Kühn,) on various species of *Vaccinium*, no supposed æcidium form has been found; in this case the almost universal association of the teleutospore form on *Vaccinium* and one or more species of *Peridermium* on *Pinus* and *Abies* seems to strongly indicate their genetic relations.

Other observations corroborate the supposed connection, so that in Europe at least we may accept the matter as a fact that this species of *Melampsora* and *Æcidium* (*Peridermium*) *columnare*, Alb. & Schw., are alternate forms. In America *Peridermium balsameum*, Pk., seems to be associated with the teleutoform, but whether *P. balsameum* and *P. columnare* are specially identical has not been determined. See Farlow Appalachia, Vol. III. (1884), p. 241, *et seq.*

M. epilobii, (Pers.) Fkl.

II and III. Hypogenous; uredosori scattered, minute hemispherical, opening by a circular stoma; uredospores obovate, sometimes varying to subglobose and oblong, epispore thin, sharply echinulate, each produced on a pedicel, orange-yellow, 12–15 by 14–18 μ; teleutosori irregular, scattered, often confluent in irregular, crust-like areas, becoming chestnut-brown, or at length darker; teleutospores mostly one-celled, often divided by a septum which is horizontal, oblique or vertical, cuboidal or elongated epispore thin, smooth, 21–39 μ long. On *Epilobium coloratum*.

Persoon described (Syn. Fung. p. 219) *Uredo pustulata* var. *epilobii*, and DeCandolle wrote *Uredo epilobii* (Flore Franc. II, p. 226) and Fuckel described the teleutoform and referred the uredo to the same species. The name, *Uredo pustulata*, Pers., has been used for various species.

M. crotonis, Burrill.

II and III. Amphigenous; uredosori scattered, rather prominent, circular, cinnamon-colored; uredospores obovate, sharply echinulate, produced on pedicel, 15–21 by 18–27 μ; teleutosori irregular, scattered or somewhat confluent, slightly elevated, reddish-brown; teleutospores irregular, mostly elliptical or oblong, one, two or more celled, arranged in an irregular layer composed of variously imbricated spores, smooth; cell contents granular, pale to dark brown, 11–15 by 30–42 μ. On leaves of *Croton capitatum; C. monanthogynus* and *Crotonopsis linearis*.

The uredo is *Trichobasis crotonis*, Cke. The teleutoform seems to belong to the group separated by Magnus under the generic name of *Phragmospora*, but it is not easy to make out the relation of the spores to the cells of the host in dried specimens.

M. salicina, Lév.

II and III. Amphigenous, the uredo mostly hypophyllous and the teleutoform more often epiphyllous; uredosori small, circular, often thickly spread over the leaf surface: uredospores subglobose or elliptical, finely echinulated, 12–15 by 14–18 μ; teleutosori various in size, usually flat, irregular, often thickly associated or confluent, crust-like, becoming reddish-brown or dark-brown; teleutospore oblong, in transverse section polygonal, about 10 by 30–37 μ. On leaves of *Salix cordata, L. longifolia*, and other species.

Thümen thinks what is included in the above should be separated into the following species for which he has given descriptions: *M. Biglowii; M. caprearum; M. Hartigii; M. medusæ; M. vitellinæ;* (Hedwigia XVIII (1879) p. 77, and Bulletin Torrey Botanical Club VI, p. 216).

M. populina, Lév.

II and III. Amphigenous; uredosori small, scattered over the surface of the leaves, usually more numerous below, circular, surrounded by a dense row of paraphyses which are clavate or strongly enlarged and rounded above, powdery, orange-yellow; uredospores varying from subglobose to oblong or clavate, echinulate, 13–20 by 21–30 μ; teleutosori scattered, mostly thickly studding both surfaces of the leaf, flat, compact, crust-like, often confluent, reddish brown; teleutospores oblong, prismatic, epispore thin, smooth, one-celled, 15 by 36–45 μ. On leaves of *Populus tremuloides*; *P. monilifera*.

Genus COLEOSPORIUM, Lév.

Teleutospores divided by horizontal septa (about three) so as to form unbranched vertical rows of closely connected cells, each of which emits on germination a promycelium, compacted in a dense, flat or convex, somewhat waxy stratum; uredospores produced in chains which soon break up into a powdery mass.

The species of this genus are difficult to determine morphologically one from another, and comparatively little has been done towards elucidating life-histories through cultures. It is supposed that *Colesporium senecionis* and *Peridermium pini* are alternate forms of one species, but other æcidial states are unknown. The so-called uredospores are produced in chains and according to the adopted classification, would by themselves fall in the genus *Cæoma*. The query arises as to whether this should be looked upon as the æcidium or uredo stage. So far as observed, this form grows on the same leaf and usually just before the teleutoform, characteristics of the latter rather than the former. If indeed *Peridermium pini* is the æcidium form of *Coleosporium senecionis*, then the pulverulent spores on *Senecio*, one would say, must be the uredo form, and these are very similar to the first formed spores of the other species.

C. sonchi-arvensis, (Pers.) Lév.

II and III. Hypogenous, rarely epiphyllous; uredosori scattered or united in groups, often very numerous and sometimes crowded or confluent, elliptical or irregular, powdery; uredospores elliptical, often irregular, thickly studded with little obtuse tubercules, orange-yellow, but soon fading, 15–21 by 19–24 μ; teleutosori scattered or united in groups, often very numerous and sometimes confluent, low, at first orange-yellow, changing to pale reddish-brown; teleutospores about four-celled, cylindrical or enlarged above; epispore thin, smooth.

On leaves of *Vernonia fasciculata; Elephantopus Carolinianus; Aster sagittifolius; Aster sps.; Solidago latifolia; S. altissima; S. ulmifolia; S. Canadensis; S. gigantea; Solidago sps.; Silphium integrifolium* and *S. terebinthinaceum*.

The name adopted is from *Uredo sonchi-arvensis*, Pers. For the fungi here included many names have been proposed under the idea of specific distinctness. But whatever differences exist seem to be so connected by intermediate forms that those upon the host-plants named are considered specifically identical. There is therefore included such as have been named, *Uredo soludaginis* Schw., *U. terebinthinaceum*, Schw., *Coliosporium compositarum*, Lév., *Uredo* or *Cæoma elephantopsidis*, Schw., *Coleosporium vernoniæ* B. & C. and *C. solidaginis*, Thüm. Perhaps the form on *Vernonia* differs more than others from the type on account of the uredospores being smaller and the teleutospores being more enlarged above. On *Elephantopus* the teleutosori are grouped in circles.

C. ipomœæ, (Schw.)

II and III. Hypophyllous; spores yellowish or none; sori minute, scattered or irregularly clustered, circular. II. Uredo spores irregularly oval, strongly echinulate, 18 by 26 μ. III. Sori convex, deep reddish-orange; spores (chains) oblong or slightly clavate, conspicuously 4–6 septate, about 10 by 26 μ, segments widest transversely. On leaves of *Ipomœa nil*; *I. lacumosa*; *I. pandurata*; (*Uredo ipomœæ*, Schw.)

Genus CHRYSOMYXA, Unger.

Teleutospores composed of several cylindrical cells in simple or branched vertical rows, the lower cells sterile, each of the upper producing a several celled promycelium bearing about four sporidia; sorus naked, compact, flat or convex, red or orange-yellow; uredospores in vertical rows, soon pulverulent in a naked sorus.

It is understood that *Peridermium abietinum*, (Alb. & Schw.) is genetically related to one or more species of this genus as the æcidium stage.

Not, so far, observed in Illinois.

Genus UREDO, Lév.

Spores one-celled, produced singly on pedicels from which they readily separate at maturity, forming a powdery mass, sorus without pseudoperidium, without spermogonia.

Many, perhaps all, are forms of plants belonging to other genera, classified by the teleutospores, as *Uromyces Puccinia*, etc., and constitute what is known as the second stage of the *Uredineæ*; but some of the so-called species have not yet been connected even in supposition with any teleutosporic forms. The spores germinate at maturity and soon lose their vitality; the germ tube produces the mycelium directly, without the intervention of sporidia. The sorus is in some cases surrounded by paraphyses usually club-shaped, and incurved, a characteristic of the so-called genus *Lecythea*.

U. hydrangeæ, B. & C.

Hypogenous; spots small, yellowish, more or less confluent; sori minute, scattered, few; spores, obovate, produced on pedicles, minutely tuberculate 12–18 by 24 μ. On *Hydrangea arborescens*.

This name is attached to specimens in the Curtis herbarium and published in Curtis' catalogue Plts. N. C. p. 122, with description. The description is taken from specimens collected by Mr. F. S. Earle, Cobden, October 13, 1870. There is no evidence of the occurrence of the fungus elsewhere in the State.

Genus CÆOMA, Tul.

Spores one-celled, produced in vertical chains, soon separating in a powdery mass; sorus without pseudoperidium, but sometimes covered by a thin adherent membrane, often with spermogonia and with or without paraphysis.

The term *Cæoma* has been used with several and very different significations. As here limited it does duty, probably temporary, as a genus of so-called species of which teleutosporic forms are still unknown. As defined the genus differs from *Uredo* in the manner of the production of the spores and from *Ædidium* in the absence of a peridium. According to some authors the presence of spermogonia is taken as the special characteristic of *Cæoma* as against *Uredo*, so that with these writers the forms having spores in chains, but without spermogonia are arranged under the latter, as for example the so-called *Uredo Agrimoniæ*, herein found as *Cæoma agrimoniæ*, Schw. It, however, seems pretty evident that, with or without spermogonia, those forms having spores in chains represent rather the æcidial than the uredo stage, and as some species of æcidium have no spermogonia the absence of the latter in *Cæoma* ought not to be unlooked for.

Some of the so-called *Cæoma* have been identified as the æcidial forms of *Phragmidium*, which see. Compare also *Coleosporium*.

C. agrimoniæ, Schw.

Hypogenous; spots yellowish, often confluent and more or less spreading over the surface. Sori small, irregular, mostly thickly associated in patches over the whole surface, orange; spores subglobose, elliptical; epispore rather thin, finely echinulate, 14–16 by 15–20 μ. On *Agrimonia Eupatoria* and *A. parviflora*.

This has been named *Uredo agrimoniæ*; it was placed by Schweinitz in the *Uredo* section of *Cæoma*, the latter including according to him all allied species. But the spores are produced in chains, not borne singly upon a stalk. On this account probably, Bonorden (Beitr. z. Kent. d. Coniomyc, p. 20) assigned it to the genus *Coleosporium*, hence it is known as *Coleosporium ochraceum*. There is, however, no question but that the form is the uredo stage, not the teleutospore. Until the latter is known it must therefore be *Cæoma*, and the specific name should at all events stand as above.

C. nitens, Schw.

Hypogenous; sori irregular, flat, usually thickly associated and confluent, more or less covering the surface, (sometimes occurring in patches on the stems) bright orange-yellow, spores subglobose elliptical or oblong; epispore thin, finely tuberculate, 12–24 by 18–34 μ; spermogonia scattered, mostly on upper side of leaf, minute, yellow.

Schweinitz (Syn. Car., 458) calls this *Æcidium nitens*, and afterward (Syn. N. A. Fungi) *Cæoma* (sub-genus *Æcidium*) *luminatum*. The last name has been very frequently used, but without good authority. On *Rubus villosus* (blackberry) and *R. occidentalis* (raspberry).

This is the well known "orange rust" of the blackberry and more rarely of the black-cap raspberry occurring in May and June. It is unquestionably a fruit form or undeveloped stage of some teleuto-

sporic species and this has been thought to be most probably a *Phragmidium*. Some recent observations, however, tend to show that it belongs to *Puccinia Peckiana*, Howe, which is found on the same host plants and matures in September.

Genus ÆCIDIUM, Persoon.

Spores one-celled, in chains or vertical rows, without pedicels; sorus inclosed in a short beaker-like pseudoperidium which protrudes through the ruptured epidermis of the host and opens regularly at the vertex, the border soon becoming toothed or lobed and usually recurved; with spermogonia.

This was supposed to be a true genus of automatous species, but it is now believed that all the supposed species belong to *Uromyces* and *Puccinia*, and constitute what is known as the first or æcidial stage in the alternations of development. Before, however, anything like exact knowledge as to special genetic relation can be ascertained, carefully made artificial cultures must be practiced by competent investigators. Where there is good reason for accepting the demonstrations as satisfactorily made, the forms have been included in their proper places with the teleutospore; otherwise they follow here under the designation of species.

Æ. ranunculacearum, DC.

Hypophyllous; spots distinct, yellowish, mostly small; æcidia irregularly and densely clustered, short, erect or at length more or less recurved and many times divided, becoming pulverulent, pale yellowish; spores subglobose or elliptical, epispore rather finely but conspicuously tuberculate, 18 by 21–24 μ; spermogonia minute, honey-yellow, mostly scattered on the upper surface of the affected area. On *Anemone Pennsylvanica*.

Æ. ranunculi, Schw.

Mostly hypogenous; equally, usually densely associated over the whole surface of the leaf or over definite patches; æcidia short, recurved, border narrow or many times split, spores subglobose or elliptical, finely echinulate, 15–21 by 18–24 μ; spermogonia numerous, scattered among the æcidia on the same side of the leaf, minute. On *Ranunculus abortivus*.

Æ. punctatum, Pers.

Hypophyllous; spots effused, yellowish, æcidia uniformly scattered over large proportions, or the whole, of the leaf surface, not usually crowded, rather large, deeply divided into few (about four) widely

spreading, recurved lobes, thin but firm, spores almost smooth, brown, about 18–21 μ, or 15–18 by 21–27 μ; spermogonia uniformly and remotely scattered on both surfaces, conspicuous, reddish brown. On *Hepatica triloba* and *Anemone nemorosa.*

This is *Æcidium quadrifidum*, DC. There is on *Anemone nemorosa* a species supposed to be different, (not so far found in Illinois,) known as *Æ. anemones*, Pers., or *Æ. leucospermum*, DC. In this last the pseudoperidium is more often, but less deeply, divided, and the border more distinctly rolled, and the spermogonia are very much less conspicuous, produced, however, in the same way. The spores have thinner walls, are lighter colored, ard are said to be more elongated. In the latter respect, however, in the specimen collected by Arthur, the spores are commonly quadrangular, and considerably longer than wide. A Massachusetts specimen agrees with the typical *Æ. punctatum*, except that the spermogonia are confined to the lower side of the leaf. That on *Hepatica triloba* is distinctly *Æ. punctatum.*

Æ. actææ, (Opiz) Wallr.

Æcidia orderless, or in circular groups, on pale spots, which latter are blackish in the center, pseudoperidia short-cylindrical, with many times split and recurved border; spores polygonal, pale yellow, fine-warty, 16–26 μ in diameter to 30 μ long. (Winter *Die Pilze*, p. 268.) On *Actæa.*

The description is taken from European specimens; those from Illinois are not fully developed, but seem to be the same.

Æ. dicentræ, Trelease.

Hypophyllous; æcidia uniformly and remotely scattered over the entire surface; rather large, prominent; border regularly segmented and quite uniformly and abruptly rolled, firm; spores subglobose or elliptical, epispore thin, minutely tuberculate, 10–13 by 11 16 μ; spermogonia large, disk-like, rather distant, in a single row, on the margin of the leaf; reddish brown. On *Dicentra Cucularia.*

Æ. Mariæ-Wilsoni, Pk.

Hypogenous; spots small, definite, not thickened, yellowish; æcidia small, short-cylindrical, border narrow, many times split and recurved, subcircinate; spores subglobose or somewhat angular; epispore thin, minutely tuberculate, 11–15 μ; spermogonia preceding and with the æcidia, mostly on the upper side of the leaf. On leaves of *Viola cucullata.*

This seems to differ from *Æ. violæ* in the leaf spots not being thickened, in the smaller æcidia and spores, and in the presence of spermogonia. Specimens from Professor Trelease, labeled *Æ. Petersii*, B. & C., on *Viola delphinifolia*, cannot be distinguished from the species described above, and earlier named by Peck.

Æ. hibisciatum, Schw.

Hypophyllous; spots usually few, large, thickened, definite, brown with a yellow border; peridia mostly densely crowded, sometimes irregularly circinate, subimmersed; spores broadly oval, 18 by 37 μ. On leaves of *Hibiscus militaris*.

Æ. geranii, DC.

Hypophyllous; spots definite, not large, purplish or yellow, scarcely thickened; ædia circinating, small, short, deeply and rather finely split, and much recurved; spores subglobose, epispore thin, thickly tuberculate, 18 by 21 μ; spermogonia clustered in the center of the spots, on both sides of leaf. On *Geranium maculatum*.

Æ. impatientis, Schw.

Hypogenous; spots sometimes definite, purple, yellow-bordered, more often effused, on the leaves scarcely thickened, on the petioles and stems swollen; ædia subcircinate or irregularly scattered, short, deeply and rather coarsely split and much recurved; spores subglobose or elliptical (vertical diameter shorter), epispore thin, apparently smooth, contents finely granular; 15–18 by 18–21 μ; spermogonia clustered above in the center of the definite spots, otherwise sparsely scattered on both sides of leaf. On *Impatiens*.

Æ. pteleæ, B. & C.

Mostly hypophyllous; spots distinct, yellow, thickened; ædia irregularly clustered, cylindrical, rather long, becoming numerously and deeply split and much recurved; spores subglobose or elliptical, large, conspicuously tuberculate, 21–25 by 24–30 μ; spermogonia not found. On leaves of *Ptelea trifoliata*.

There is scarcely any doubt but that the plant described above is the *Æcidium pteleæ* of Berkeley and Curtis, though the description in Grevillea is insufficient and the original specimen in the Curtis collection is so poor that its characters can not be made out.

Æ. onobrychidis, Burrill.

Hypophyllous; spots distinct or confluent, somewhat effused, yellowish-brown; ædia subcircinate, crowded, short, border abruptly recurved, rather coarsely dissected; spores subglobose or elliptical, epispore rather thin, studded with low, obtuse tubercules, sometimes united in ridges, 15–24 μ; spermogonia clustered in the center of the spots, mostly on the upper surface, minute, reddish-brown. On *Psoralea onobrychis*.

Æ psoralæ æ, Pk.

Hypophyllous; æcidia uniformly distributed over the leaf, short, soon deeply split and recurved; spores elliptical, epispore rather thick, densely tuberculate, 15-18 by 18–24 μ; spermogonia numerous, uniformly scattered among the æcidia, honey-yellow. On *Psoralea floribunda*.

Æ. leucostictum, B. & C.

Hypophyllous; spots very small, scarcely evident, not discolored; æcidia very small, irregularly clustered in little groups, short, many times split; spores subglobose, minutely tuberculate, 11–12 by 12–16 μ. On *Lespedeza procumbens*.

This is named as above in Curtis' catalogue of the Plants of North Carolina and described in Grevillea (III, p. 61) as a variety of *Æ. orobi*, Pers. The specific distinction is preferred on account of the difference in size of æcidia and spores as well as the appearance of the former.

Æ. orobi, Pers.

Hypophyllous; spots usually conspicuous, not thickened, yellow; æcidia scattered or collected in orderless groups, small or medium size, short, border many times split and recurved; spores subglobose, usually somewhat angular, epispore rather thick, studded with low obtuse tubercules, often appearing smooth, 18–11 by 21–24 μ; spermogonia few, mostly on the upper side of leaf, in the center of affected spots. On leaves of *Amphicarpæa monoica*.

This is referred to the above named species with some doubt as to the identification. The æcidia are collected in more definite groups than are found in typical specimens of the species.

Æ. grossularæ, DC.

Hypogenous; spots distinct, swollen, yellow, æcidia densely clustered, medium size, edge entire and erect, or often many times split and recurved; spores subglobose, epispore very thin, obscurely roughened, 15–18 μ. On leaves and fruit of *Ribes rotundifolium* and *cultivated gooseberry*.

Æ. epilobii, DC.

Amphigenous; æcidia scattered rather uniformly over the surfaces of the leaves, sometimes more abundant beneath, short, rather coarsely and deeply split and much recurved; spores subglobose, epispore thin, smooth or nearly so, 15–18 μ; spermogonia honey-yellow, scattered over both surfaces, more numerous above. On *Œnothera biennis*.

Æ. œnotheræ, Pk.

Hypophyllous or very sparingly produced above; spots conspicuous, usually purple, scarcely thickened; æcidia crowded in a somewhat definite circle, with a small central vacant area, short, deeply

and rather coarsely split and much recurved; spores subglobose, epispore thin, very minutely tuberculate, 15–18 μ; spermogonia few, very inconspicuous on the upper side of leaf, in the center of spots, honey-yellow. On *Œnothera biennis.*

Æ. sambuci, Schw.

Hypygenous; spots conspicuous, yellow, swollen; æcidia circinate or more often densely and irregularly crowded, short, deeply split and recurved; spores subglobose, epispore thin, minutely tuberculate, 15–21 μ; spermogonia very few in the center of the spots on both sides of the leaf. On *Sambucus Canadensis.*

On the young stems the æcidia often occur in large, dense clusters with much distortion of the host.

Æ. diodiæ, Burrill.

Hypophyllous, on the cotyledons and rarely lower leaves; spots distinct, small, greenish-brown; æcidia few, in little irregular clusters, small, short, border little or not at all recurved; spores subglobose or elliptical, epispore rather thin, tuberculate, 17–21 by 21–30 μ; spermogonia rather numerous, scattered above, not found on many of the spots. On *Diodia teres.*

This may be the æcidium of *Uromyces spermacoces* which grows on the same host.

Æ. cephalanthi, Seymour.

Hypogenous; spots distinct, brown, scarcely thickened; æcidia numerous, irregularly crowded, short, the strongly recurved narrow border abrupt, finely divided; spores large, subglobose or elliptical, epispore very thick, very conspicuously reticulately roughened, 28–36 by 33–43 μ; spermogonia scattered over the upper side of infected area, minute, reddish-brown.

On *Cephalanthus occidentalis:* Ravenswood, near Chicago, June, 1883, J. C. Arthur; Quincy, July, 1883, C. A. Hart.

Æ. houstoniatum, Schw.

Hypophyllous; æcidia scattered over the entire leaf, small, very short, many times split, spores globose or elliptical, often angular, minutely tuberculate, 12–15 by 15–18 μ; spermogonia numerous, conspicuously appearing before the æcidia, scattered over the entire undersurface, occasionally above, purple. On *Houstonia cærulea.*

The infected plants are easily recognized, as the fungus causes them to grow more slender and more strictly erect, often taller, and gives them a yellowish appearance.

Æ. erigeronatum, Schw.

Hypophyllous; spots usually distinct, large, swollen, yellow; æcidia subcircinate or irregularly crowded, short, soon many times divided and much recurved, fragile, soon becoming pulverulent; spores sub-

globose, epispore thin, tuberculate, 12–15 μ; spermogonia indistinct, few, usually centrally crowded mostly on upper side of leaf. On *Erigeron Canadense*, *E. bellidifolium*, *E. Philadelphicum* and *E. annuum*.

Æ. asterum, Schw.

Hypophyllous; spots usually distinct, somewhat swollen, yellow or purple; æcidia subcircinate or irregularly crowded, short, deeply divided and recurved, soon becoming pubverulent; spores subglobose, epispore thin, tuberculate, 12–17 μ; spermogonia rather indistinct, few, mostly on upper side, yellow. On *Aster sagittifolius* and other species: *Solidago latifolia*, *S. cæsia*, *S. rigida*, *S. altissima*, and other species of *Solidago*.

Schweinitz first separated those on *Solidago* under the name of *Æ. solidaginis*, but subsequently united them with the *Aster* forms. His change in the form of the specific name *Æ. asteratum* is not followed. There seems to be a different *Æcidium* on *Solidago*: See Ellis' North American Fungi, No. 1008.

Æ. compositarum.

Under this name are united all the *Æcidia* on *Compositæ* except the two foregoing, whose teleutoforms are doubtful. It is impossible to satisfactorily determine them until the full life histories are worked out. It is even impossible to give in this place a description of the species known as *Æcidium compositarum*, Mart., neither is it deemed wise to try to refer anything to the Schweinitzian species *Æ. helianthi mollis* and *Æ. trachelifoliatum*. Taking the host plants as a guide to a considerable extent, the following *forms* are noted:

On *Eupatorium*: hypophyllous; spots definite, usually few, conspicuous, yellowish; æcidia irregularly clustered or somewhat circinate, short, irregularly split and moderately recurved, soon pulverulent; spores subglobose, epispore rather thin, minutely tuberculate 18 to 20 μ; spermogonia several, scattered centrally above, honey-yellow. On *Eupatorium perfoliatum*.

On *Silphium:* hypophyllous and often also epiphyllous; spots distinct, usually widely scattered, not large, yellow; æcidia irregularly associated, scarcely crowded, deeply immersed and but slightly projecting above the raised epidermal border, margin many times split or pulverulent, little excurved; spores subglobose, often angular, 11–15 μ; spermogonia rather few, conspicuous, reddish-brown, central on both sides of leaf. On *Silphium integrifolium*, *S. terebinthinaceum* and *S. lacineatum*.

On *Ambrosia:* hypophyllous; spots large, often confluent, scarcely thickened, yellow or purplish-brown; æcidia not densely crowded, irregularly distributed over the spot, with, however, a free central area, short but not deeply immersed, firm, the coarsely divided border widely and elegantly recurved; spores subglobose, usually angular, epispore firm, smooth, 12–15 μ; spermogonia few, central, on both leaf-surfaces, reddish-brown. On *Ambrosia trifida*.

On *Xanthium:* hypophyllous, very rarely also epiphyllous; spots not large, distant, scarcely thickened, yellowish, sometimes tinged purple; æcidia not densely crowded, irregularly distributed or subcircinate, mostly irregular in outline, deeply immersed and protruding little above the raised epidermal border, the margin pulverulent, rarely lobed or excurved; spores subglobose or elliptical, often angular, epispore rather thin, minutely tuberculate, about 15–18 μ; spermogonia few, central, mostly above, minute, yellowish-brown. On *Xanthium strumarium.*

This is much like the form on *Silphium* and answers in some respects to *Æ. verbesinæ,* Schw., and also to *Æ. tracheliifoliatum,* Schw., but it is probably neither. The *Æcidium* is often followed by *Puccinia xanthii,* Schw., and may be connected therewith.

On *Helianthus:* hypophyllous, rarely also epiphyllous; spots distinct or confluent, usually yellow, somewhat thickened; æcidia subcircinate, not usually densely crowded, short, not deeply immersed, deeply split and widely recurved, at first firm but soon becoming pulverulent; spores subglobose or elliptical, minutely tuberculate; spermogonia few, central, mostly on upper side of leaf, inconspicuous, yellowish-brown. On *Helianthus* species.

There seems to be two species on *Helianthus,* and in one instance on the same individual plant. In one case the æcidia are in large clusters with spores about 12–14 by 13–16 μ: in the other case the clusters are small and the spores measure about 15–21 by 20–24 μ.

On *Bidens:* hypophyllous very rarely, also epiphyllous; spots mostly rather large, effused, often confluent, purple, scarcely thickened; æcidia sparsely scattered, rather prominently elevated, border abruptly and rather conspicuously recurved, firm; spores subglobose, epispore thin, minutely tuberculate, 15 to 17 μ; spermogonia few and inconspicuous, mostly central below, often altogether wanting. On *Bidens frondosa.*

On *Lactuca:* hypophyllous; spots definite, conspicuous, thickened, mostly widely separated, but sometimes numerous and occasionally confluent, purple then brown; æcidia mostly crowded around a free central space, rather numerous, short, many times irregularly split and widely recurved or pulverulent; spores angular, irregularly subglobose or broadly oval, epispore thin, minutely tuberculate 15 to 18 μ; spermogonia rather numerous, scattered centrally above, large, convex, reddish-brown. On *Lactuca Canadensis.*

Æ. plantaginis, Ces.

Amphigenous; spots usually small, sometimes effused and large; æcidia collected in little groups or loosely scattered, short cylindrical, little or not at all recurved, spores subglobose or elliptical, tuberculate, 18–21 μ; spermogonia seldom found, mostly preceding the æcidia, scattered over the spot on either side of leaf. On *Plantago Virginica.*

The determination of this species was made from the specimen in Ravenel's Fungi Americana. No. 483.

Æ. lysimachiæ, (Schw.) Wallr.

Hypophyllous (also on the petioles); spots distinct, yellowish, scarcely thickened; æcidia somewhat circinate, short, the recurved border very narrow; spores subglobose, epispore thick, conspicuously tuberculate, 21–24 by 22–27 μ; spermogonia few, central above. On *Lysimachia ciliata*.

The above description is taken from specimens on *Lysimachia ciliata*, and agrees, save in the irregular circinate arrangement of the æcidia, with the specimens in Rabenhorsts' Fungi Europæi No. 391. A specimen from Wisconsin on *L. lanceolata* is distinct, especially in the characteristics of the spores, but otherwise as well. It is not known what the Schweinitzian *Æcidium lysimachiæ* is. If the same as Schlechtendal's *Caoma lysimachiæ* the second authority for the name should be Schweinitz; if different, the question arises as to which name shall be allowed to stand. At all events, there does not seem to be good reason for writing as is sometimes done *Æcidium lysimachiæ*, Lk.

Æ. pentstemonis, Schw.

Hypophyllous; spots definite, purple, yellow-bordered, usually small, somewhat thickened; æcidia clustered, short, the deeply recurved border rather coarsely split; spores subglobose, inconspicuously tuberculate, 18–21 μ; spermogonia few, central in the spots on both sides of leaf. On *Pentstemon pubescens*.

Æ. lycopi, Gerard.

Hypogenous; spots circular, distinct or more or less confluent scarcely thickened, purplish-brown; æcidia on the leaves mostly circinate, often in a single circular row, sometimes by the confluence of the spots loosely and irregularly scattered, on the petioles and stems irregularly crowded, short, recurved border abrupt and much torn; spores subglobose, epispore thin, tuberculate 15–18 μ; spermogonia few, centrally clustered above, reddish-brown. On *Lycopus Europæus*.

Differs from Gerard's description in the arrangement of the æcidia and less swollen spots.

Æ. myosotidis, Burrill.

Hypogenous; æcidia uniformly distributed over the leaf, mostly somewhat densely crowded, rather large, somewhat prominent, the recurved border wide and rather coarsely divided; spores subglobose or elliptical, epispore thick, conspicuously tuberculate, 15–18 by 18–22 μ; spermogonia numerous, uniformly scattered over both surfaces of the leaf, reddish-yellow. On *Myosotis verna*.

The distribution of the æcidia is decidedly different from that of *Æcidium asperifolii*, Pers., as described, as well as the specimens at hand, and similarly different from those named *Æcidium lycopsidis*, Desv., *Æ. lithospermii*, Thüm, and *Æ. symphyti*, Thüm. The three last are made synonyms of the first by Winter and all are said to be the *Æcidia* of *Puccinia rubigo-vera*. The latter is common in Illinois in wide areas where *Myosotis* does not occur, and no other species of *Borraginaceæ* has been observed infested with *Æcidium*.

Æ. hydrophylli, Pk.

Hypophyllous; spots conspicuous, distinct, yellowish; æcidia subcircinate, short, recurved border rather wide and deeply divided; spores subglobose, epispore thin, smooth or nearly so, 18–21 μ; spermogonia numerous, scattered over the central area of the spot above. On *Hydrophyllum appendiculatum*.

Æ. polemomi, Pk.

Hypophyllous; spots usually distinct, yellowish brown, border effused; æcidia irregularly clustered, usually about a free central area, short, recurved border wide and rather coarsely divided; spores subglobose or elliptical, often angular, epispore thick, conspicuously tuberculate, 18–21 by 21–25 μ: spermogonia few, central on both surfaces. On *Polemonium reptans* and *Phlox pilosa*.

Æ. solani, Mont.

Hypogenous; æcidia uniformly, usually densely, distributed in patches on the leaf surface, short, friable, soon becoming pulverulent; spores subglobose or elliptical, often angular, epispore rather thick, obscurely tuberculate, 13–15 by 15–21 μ; spermogonia very abundant, hypophyllous, scattered over extended patches with or without æcidia, comparatively large, honey-yellow. On *Physalis viscosa*, Champaign, T. J. Burrill.

There is a *Puccinia physalidis*, Pk., from Colorado, of which the above may be the æcidium form. But so far as known the *Puccinia* has not been collected east of the Mississippi.

Æ. apocyni, Schw.?

Undeveloped. On *Apocynum cannabinum*.

Æ. Jamesianum, Pk.

Amphigenous, on the leaves more abundant beneath; spots circular, distinct or often confluent, on the leaves somewhat and on the stems much swollen; æcidia subcircinate or irregularly crowded, short, pseudoperidium fragile, soon becoming pulverulent; spores

subglobose or elliptical, epispore very thick, conspicuously and densely tuberculate, the tubercles often united in short irregular ridges 21–36 by 24–45 μ, usually about 30 by 39 μ; spermogonia numerous, scattered or centrally clustered about, nearly black. On *Asclepias Cornuti.*

Occurs on stems, petioles and midribs forming swellings and on both sides of the leaf, being most plentiful on the lower surface. It is very destructive, eating holes in leaves and stems. The spores are very remarkable for size, marking and thickness (5 μ) of epispore. There is a different *Æcidium* on *Asclepias Cornuti*, specimens of which were received from E. W. Holway, Decorah, Iowa, labeled *Æ. Jamesianum.*

Æ. fraxini, Schw.

Hypogenous, occurring especially along the veins and upon the leaf-stalks; spots definite, swollen, often purplish, æcidia more or less densely clustered, few or many, elongate, cylyndrical, tardily lacerated, but ultimately deeply split and recurved; spores elliptical, epispore thin, tuberculate, 21–24 by 24–32 μ; spermogonia rather numerous, scarcely elevated, on the upper side of the leaf, scattered over central area of the spot. On *Fraxinus viridis.*

Æ. pustulatum, Curt.

Hypogenous; spots small, reddish-yellow, thickened; æcidia rather densely crowded, often in a small circle with a vacant center, short, rather finely split and recurved; spores subglobose, inconspicuously tuberculate, 16–21 μ; spermogonia few, yellowish, epiphyllous, difficult to make out. On *Comandra umbellata.*

Æ. eurphorbiæ, Gmel.

Hypophyllous; æcidia uniformly scattered over the entire surface short, the narrowly recurved border soon becoming pulverulent; spores subglobose to oblong, often irregular and angular, epispore rather thick, tuberculate, 12–15 by 15–24 μ; spermogonia scattered among the æcidia or none, not found on upper side of leaf. On leaves of *Euphorbia polygonifolia, E. hypericifolia, E. maculata,* and *E. dentata.*

This occurs with *Uromyces euphorbiæ,* but genetic connection has not been ascertained for our plants. Persoon is often given as an authority for this name, but in his Syn. Fung. p. 211, he refers to Gmelin as the author. *A. euphorbiæ hypericifoliæ,* Schw., is probably a synonym.

Æ. crotonopsidis, Burrill.

Hypogenous, occurring upon the cotyledons and less commonly on the caudicle and lower leaves; spots distinct, dark colored, the affected cotyledons soon yellow; æcidia not numerous, irregularly

clustered, short-cylindrical, becoming coarsely divided and widely spreading, pseudoperidium thin but firm; spores irregular, mostly elliptical, epispore rather thick, tuberculate, 12–15 by 15–18 μ; spermogonia very few, scattered, above. On *Crotonopsis linearis*.

Æ. urticæ, Schum.

Hypophyllous; spots distinct, brown, border yellow; æcidia densely clustered, short, the narrow border abruptly turned, finely divided; spores subglobose, epispore rather thin, sparsely tuberculate, 15–21 μ, spermogonia minute, scattered, on the upper side of spot, reddish brown. On *Urtica*. Coll. C. A. Hart.

Æ. smilacis, Schw.

Hypophyllous; spots large, circular, somewhat effused, pale yellowish, somewhat thickened, æcidia irregularly scattered or crowded, short, recurved border wide and rather coarsely divided; spores irregular, mostly angular, elliptical to oblong, epispore thick, conspicuously tuberculate 15–18 by 18–22 μ; spermogonia numerous, scattered, mostly above, honey-yellow. On *Smilax herbecea*. Coll. J. C. Arthur.

Æ. trillii, Burrill.

Hypophyllous; spots distinct or somewhat confluent, circular, effused, yellowish; æcidia densely aggregated around a free central circular space, sometimes with a more or less distinct outer circle later in development, short, pseudoperidium thin, fragile, soon after opening becoming pulverulent; spores subglobose, epispore very thin smooth, 19–24 μ; spermogonia very numerous, rather prominent, scattered, on both sides of leaf. On *Trillium recurvatum*.

Differs from *Æ. convallariæ* in the more fragile and fugacious æcidia and in the smooth, very much thinner epispore.

Æ. convallariæ, Schum.

Hypophyllous; spots distinct or more or less confluent, lemon-yellow, scarcely thickened, æcidia loosely clustered, irregular or subcircinate, short cylindrical, recurved border narrow and abruptly turned; spores subglobose or oval, sometimes angular, epispore thick conspicuously tuberculate, 21–24 by 24–30 μ; spermogonia numerous, scattered over the central area of the spot on both surfaces, dark reddish-brown. On *Smilicina stellata* and *S. racemosa*.

Genus RŒSTELIA, Rebent.

Spores one-celled, in chains or vertical rows, without pedicels; sorus inclosed in an elongated, usually tapering pseudoperidium, which protrudes far through the ruptured epidermis of the host, and which becomes deeply split and fringed; with spermogonia. On species of *Pomeæ*.

The forms included here are supposed to be (like those of *Æcidium*) mere stages of development of other teleutosporous species, and perhaps all belong to *Gymnosporangium*. The genetic connection of the forms placed in these two genera was first shown by Oersted, of Denmark, in 1865, who satisfied himself, by artificially sowing the spores, of the relationship existing. His conclusions have been confirmed by DeBary in Germany, Cornu in France, and Cramer in Switzerland, but nothing conclusive has been ascertained in our country, save from the effects in nature of the juxtaposition of the different host plants and their parasites. Professor Farlow's artificial cultures (The Gymnosporangia of the United States, p. 32, etc.,) gave not only negative results, but tended to throw doubt upon previous conclusions. In Illinois one species only of *Gymnosporangium* has been collected, (on *Juniperus Virginiana*,) and wherever this has been observed near apple orchards, the latter have been strikingly infested with *Roestelia*. Unfortunately, the specific type of the latter (from anatomical characteristics) cannot be given at the time of this writing. It is, however, most probably *R. lacerata*.

R. lacerata, (Schw.) Fr.

Hypophyllous, sometimes on the stems and young fruit, seated on the yellow pulvinate thickenings of the leaves; slender, cylindrical or somewhat subulate, recurved, densely clustered, 5–30 together; peridia yellowish-white, rather delicate, soon splitting and becoming fimbriate, the divisions not extending to the base of the peridium; cells of peridium narrow, 20 μ broad by 55–75 μ long; spores brownish, roundish-oblong, surface finely granulated, 19–24 μ in diameter. Spermogonia in yellowish spots on the upper surface of the leaves. (Farlow, Gymnosporangia of the U. S., p. 30.) On leaves of *Cratægus tomentosa* and *C. coccinea*.

R. penicillata, (Schw.) Fr.

Same as *R. lacerata*, but æcidia smaller and frequently concentrically arranged, peridia splitting to the base, the divisions very numerous, revolute, fimbriate, formed of one or more rows of cells. (Farlow, Gymnosporangia of the U. S., p. 80). On leaves of *Byrus coronaria*.

Genus PERIDERMIUM, Link.

Spores one-celled, in chains or vertical rows, without pedicels; sorus inclosed in a variously shaped pseudoperidium which protrudes from the ruptured substratum and bursts irregularly; with spermogonia. On *Coniferæ*.

This so-called genus is composed of probable æcidium forms of *Melampsora*, *Chrysomyxa* and *Coleosporium* species. The mycelium of this stage is however perennial in the bark and medullary rays of coniferous trees, from which the *Peridermium* fruit may be annually produced during seventy or more years, the infected parts of the host in the meantime becoming variously deformed and the normal growth prevented.

Not yet observed in Illinois.

Genus ENDOPHYLUM, Léveillé.

Teleutospores one-celled, produced in chains or vertical rows, with pedicels, the sorus inclosed in a pseudoperidium immersed in the substratum; without pleomorphism, except in the development of spermogonia.

This genus was at first separated from *Æcidium* only on account of the immersed pseudoperidia which unlike those of the latter genus do not protrude through the ruptured epidermis to form a separate cup-like organ; but later investigations have shown that the spores in germination emit a true promycelium bearing sporidia, altogether similar to the germination-development of the teleutospores of *Puccinia* and of the other genera of *Uredineæ*. The mycelium in the newly affected plant survives the winter and fruits the next spring.

No species yet observed in Illinois. They may be looked for on *Crassulaceæ* and probably on *Euphorbiaceæ*.

GLOSSARY.

Apiculus, a little prominence or tooth on the apex of a spore.

Æcidium (pl. æcidia), formally only used as the name of a genus; now also to designate one of the fruit forms of species of *Cronyces*, *Puccinia*, etc. The name is frequently applied to the cup which incloses the spores.

Æcidiospores, the spores of *Æcidium*.

Amphigenous, produced on any part of the leaves and stems.

Circinate, arranged in a circular manner.

Colyledon, a seed-leaf.

Deciduous, soon breaking or falling off.

Dimorphism, two forms, applied to the peculiar alternation of fruit forms in the *Uredineæ*. See page 11.

Echinulate, beset with short, sharp pointed spines.

Epidermis, the skin-like covering of leaves, etc.

Epigenous, produced on upper side of the leaves.

Epiphyllous, used synonymously with epigenous.

Epispore, the coat or wall of a spore.

Excurved, curved outward.

Fimbriate, finely divided, forming a fringe.

Fugacious, very early falling off.

Fungus (pl. fungi), a plant of low organization, devoid of the green coloring matter usually present in leaves, and dependent on organic matter for nutriment, *i. e.* parasitic or saprophytic.

Host, the supporting or nourishing plant upon which a parasite grows.

Hyaline, nearly transparent, glass-like.

Hypha (pl. hyphæ), a single thread or stem of a fungus. The vegetative hyphæ are collectively called the *mycelium*.

Hypogenous, produced below—used in a more general sense than hypophyllous.

Hyphyllous, produced on under surface of the leaves.

Incurved, turned or bent towards the center.

Involute, rolled inward—in leaves upward, so that the under surface is outside.

Mycelium, the vegetative or root-like part of a fungus, composed of slender threads called *hyphæ*.

Papillate, studded with minute, obtusely pointed prominences.

Paraphyses, club-shaped bodies mixed with, or surrounding, the spores in the sorus.

Parenchyma, a tissue of thin-walled, usually rounded cells.

Parasite, in this case a fungus habitually growing upon, and deriving its sustenance from another living plant.

Pedicel, a foot-stalk, usually applied to spores.

Peridium, a covering or envelope, surrounding the spores.

Petiole, the foot-stalk of a leaf.

Pleomorphism, having two or more fruit-forms.

Polymorphism, having several fruit-forms.

Promycelium, the germinal tube of a spore which in turn produces spore-like bodies capable of germinating.

Pseudoperidium, a false peridium, the cup of *Æcidium*.

Pulverulent, powdery, dust-like.

Recurved, turned or bent outward.

Revolute, rolled outward.

Saprophyte, a fungus usually living upon dead organic matter.

Septum (pl. septa), a division wall, a partition.

Sorus (pl. sori), a spore-cluster.

Spermatia, minute organs, supposed to be capable under special circumstances of germination, produced in spermogonia.

Spermogonia, small, usually spherical, vessels, nearly immersed in the tissue of the host and finally pierced exteriorly for the escape of the spermatia, which are borne at the tips of slender stalks arising from the base and sides within.

Spore, a general term for the "fruit" of a fungus or other flowerless plant. A spore differs from a seed in having no embryo.

Sporidia, secondary spores produced on the promycelium of a spore. Also often used for the spores produced in sacks or other closed vessels.

Sterigma (pl. sterigmata), a short foot-stalk of a spore, less in size than a pedicel.

Teleutospore, the final or mature fruit-form.

Tuberculate, studded with minute, obtusely pointed tubercles, or short and blunt processes.

Uredineæ, the order of rust fungi.

Uredo, formerly only used as the name of a genus, now also as the second of the three principal kinds of spores of the *Uredineæ*.

Ustilagineæ, the order of smut fungi.

μ—.001 millimeter, or 1-25,000 inch.

I.—Æcidium, or first fruit-form.

II.—Uredo, or second fruit-form.

III.—Teleutospore, or final fruit-form.

THE CHEMISTRY OF THE HOG.

A Paper Read before the Illinois Swine Breeders' Association, Chicago, September 25, 1883.

By WILLIAM McMURTRIE, E. M., Ph. D., *Professor of Chemistry.*

During the latter part of the month of August, when wandering about the country, in the enjoyment of my summer vacation, I received from your honored president a request that I should prepare, and present at this meeting, a paper on "The Chemistry of the Hog," showing "analyses of the different parts of the carcass, fat and lean meat, etc., quality of pork best suited for food for man, and the chemical changes or causes affecting or impairing the quality of pork." I must confess a feeling of consternation at having such a request urged upon me, and having so comprehensive a subject presented to me for treatment, and I felt no little hesitation about accepting the charge thus tendered me. In the first place, I had never had occasion to give that important family of domestic animals the special study necessary to the proper performance of the task imposed, and the time intervening before the date appointed, with the press of duties at the University so closely engaging my time and attention, seemed to render any original investigation entirely impossible and impracticable. If, therefore, what I have to present to-day is wanting in matter of a wholly novel character, it must be accorded to these causes, rather than to lack of desire on my part to furnish something that you may find of interest, and that you may be able to carry away with you and apply in the practical operations of breeding, or the production of pork for market.

In general composition, the bodies of all animals exhibit comparatively little difference. Built up on a skeleton frame-work of bone are the several tissues constituting the various organs and determining the contour of the body. The matter thus supported we say

consists principally of adipose tissue and muscular tissue, or fat and flesh, and these, together with the bones connected by cartilage, membranes and tendons, surround and support the several vital organs. But in the economy of food production, in the commerce of food supply, we are concerned only with the principal constituents, and to these it is my purpose to confine myself in the consideration of the subject set for treatment.

In the animal body the adipose tissue, or the fatty tissue, is, as a rule, distributed between the muscular tissue and the skin and within the abdominal cavity around the internal organs. Sometimes it is distributed through the muscular tissue as well, but, with comparatively few exceptions, to only a very limited extent. As found immediately underneath the skin, and within the abdominal cavity, it consists of masses of cells, containing globules of fat, each of which is in turn inclosed within an exceedingly thin enveloping membrane. Underneath the skin, in most of the fat animals, it is distributed through the areolar tissue, so that in the hog the latter, in the external layer of fat, is apparently obliterated. The fat cells, themselves, have a diameter of from one-eight hundredths to one-three hundredths of an inch, and are surrounded by a membrane, the thickness of which is estimated to be not more than one-twenty-five thousandths of an inch. The fat contained within these globules consists of compounds of glycerine and the fatty acids, known as oleine and stearine, with varying proportions of palmatin, according to the species of animal under consideration. In the fat of the hog the oleine predominates, and occurs, as a rule, in the proportion of about 65 per cent., the remainder consisting of about equal parts of stearine and palmatin, by the older authorities classed as margarine.

Muscular tissue, or the lean meat of animals, is made up of two distinct groups: first that of the voluntary muscles, which are contracted entirely by the will of the animal; and, second, that of the involuntary muscles, whose functions may and do operate without the intervention of will power, as in the heart. The flesh known as the striated muscular tissue, the voluntary muscles, is that in which we are most interested in the consideration of food supply. According to Kingzett (Animal Chemistry, p. 326), it consists of about 75 or 80 per cent. of water and 15 or 17 per cent. of certain albuminous principles, while the remainder is made up of so-called extractive matter or salts. Kuhne distinguishes two important divisions in muscular tissue, and calls them *muscle clot* and *muscle serum* respectively. When muscle in a fresh state and freed from any adherent blood is frozen and thoroughly pulverized, and the pulverized mass mixed with four times its volume of snow containing one per cent. of sodium chloride (common salt), and the whole further pulverized, it will eventually become liquid, and at 30 degrees F. will pass through linen, while at zero it may be passed through filter paper. The opalescent liquid obtained when exposed at ordinary temperatures will quickly coagulate into a firm mass, which on standing will contract like the clot of blood, with a tendency to separate into flakes, leaving an opalescent liquid surrounding it. So Kuhne calls the original mass *muscle plasma*, and the separated masses *muscle clot* and *muscle serum*, respectively.

The muscle clot consists of myosin. In the muscles of freshly killed animals it is in the semi-fluid condition common to all flesh. The muscle at this time is alkaline in its reaction, but in a short time it becomes acid. This myosin now sets or coagulates, and causes the hardening or stiffening of the muscles, commonly called *rigor mortis*. It is soluble in a ten per cent. solution of sodium chloride, and in neutral salts of all degrees of concentration; exceedingly soluble in dilute alkalies and acids, but can not be separated from solutions in the latter, unchanged.

According to Kuhne, the muscle serum consists of at least three forms of albumen:

1. Albumen coagulating at 30 degrees C. (86 F.) when abundance of acid is present. Probably a mixture of potassium albuminate and sodium phosphate.

2. Albumen coagulating at 45 degrees C. (113 degrees F.)

3. A large quantity of albumen coagulating at 75 degrees C. (167 degrees F.)

There are other matters still in small quantities coagulating at 90 degrees C. (195 degrees F.) The rigor mortis is undoubtedly due in part to the coagulation of some of these albuminoids by the acids developed in the muscle after death. But DuBois Reymond believes that there is no relation between the acidity of the muscles and the rigor mortis. This acid reaction is due principally to paralactic acid, though other acids are present, such as inosinic, butyric, acetic, and formic. Other bodies are also present in small quantities, but in the dietetic relations of flesh they are of little importance as compared with the constituents already mentioned, and for our present purpose may be disregarded. They appear in the following table given by Hoffman, showing the composition of the flesh of mammals:

Solid constituents in 1,000 parts	217—255
Water, in 1,000 parts	745—783
Organic matter, in 1,000 parts	208—245
Inorganic matters, in 1,000 parts	9— 10
Coagulated albumen, sarcolemma, neudei, vessels, etc	145—167
Alkaline albuminate	28.5 —30.1
Creatinine	2.0
Xanthine and hypoxathine	0.2
Taurine (peculiar to the horse)	0.7
Lecit	0.03
Glycogen	4.1 —5.0
Lactic acid	0.4 —0.7
Phosphoric acid	3.4 —3.8
Potash	3.0 —3.9
Soda	0.4 —0.43
Lime	0.16—0.18
Magnesia	0.4 —0.41
Sodium chloride	0.04—0.1
Oxide of iron	0.03—0.1

The coagulated albumen and alkaline albuminates therefore constitute the greater portion of the organic matters of flesh, and correspond with the muscle plasma of Kuhn and syntonin of Liebig and the earlier investigators of the composition of flesh. The extent to which they differ from the albumen of egg and blood has already been shown, and in a certain sense is familiar to every one. But we see that about 75 per cent. of these solids have a nutritive value quite equivalent to that of the solids of eggs.

In nutritive value the bones occupy a very inferior position, and need scarcely be considered in such connection. Consisting of 12 per cent. water, 58 per cent. mineral matter, and 30 per cent. of organic matter, they offer more of interest because of their mineral than their organic elements. The latter consists, principally, of a nitrogenous substance known as osseine or collagen, which, though insoluble in cold water, becomes changed by the action of hot water and dissolves as gelatine or glue, and this, though much inferior to albuminous principles in nutritive value, is nevertheless considered worthy of treatment by the best authorities in the works on foods. It is of course consumed in large quantities. In the bones it is associated with more or less fat, which is distributed throughout the tissues of the spongy parts or in the marrow of the cavities. Dr. Edward Smith (Foods) considers that the nutritive value of bones, because of these constituents, is equivalent to about one-third their weight of flesh, as regards carbon, and one-seventh their weight as regards nitrogen, and that because of the relative prices of bone and flesh, the former adds to the economy of a diet. They should not, therefore, be wholly disregarded in the calculation of the values of animal products. The albuminoid substances of the animal body differ from the fatty substances in that the former contain 16 to 17.5 per cent. of nitrogen, and they are generally classed as proteine. We shall thus designate them in our further remarks. The fats, on the other hand, contain no nitrogen.

With these preliminary considerations concerning the general constituents common to all animals, we may proceed with the presentation of the facts concerning the composition of the hog in particular. The hog differs from most animals in its tendency to store up fat, and it is in this connection that it is most familiarly known. This relation is nicely illustrated in the figures obtained by Lawes and Gilbert, of Rothamstead, England, in the analyses of the different parts of the carcasses of farm animals which have become classic. The following is a general statement (Warrington Chemistry of the Farm, p. 63) of these results, after making deductions for the contents of the stomach and intestines:

Constituents.	Fat Calf...	Half Fat Ox.....	Fat Ox...	Store Sheep.	Fat Sheep	Extra Fat Sheep...	Store Pig.	Fat Pig...
Water.....	61.5	56.0	48.4	61.0	46.1	37.1	58.1	43.0
Nitrogen, matter.....	15.7	18.1	15.4	15.8	15.8	11.5	14.5	11.4
Fat.....	15.3	20.8	32.0	19.0	19.9	48.3	24.6	43.9
Ash.....	3.9	5.1	4.2	3.3	3.3	3.1	2.8	1.7

With the exception of the extra fat sheep we find that the proportion of fat in the fat pig is higher than in any of the other animals presented. According to Sanson, hogs should lose only about 15 per cent. of the live weight in slaughtering. That is, the net dead weight should be 85 per cent. the live weight. According to this authority the relation between parts should be as follows:

(*La Livre de la Ferme.*)

	Percentage of live weight.
Blood	3.2
Stomach and intestines	4.0
Liver, lungs, tongue, and heart	3.2
Fat of intestines and kidneys	9.0
Contents of stomach and intestines	1.8
Carcass	76.6
Loss	4.0

These figures are supposed to represent hogs in average condition of fattening. For English hogs Lawes and Gilbert found the following relations:

Offal parts	16.87 per cent.
Carcass	82.57 per cent.
Loss (evaporation, etc)	0.56 per cent.

This is for an average of 59 pigs having a weight of 212 pounds. (Harris on the Pig, p. 91.)

Wolff gives the following on the average composition of well fed and fattened hogs (Armsby's Manual of Cattle Feeding):

Constituents.	Well Fed.	Fat.
Blood	7.3	3.0
Entrails and contents	16.8	11.0
Flesh and fat carcass, or for the carcass	74.5	84.6
Flesh without fat and bone	46.4	40.0
Bones	8.0	5.8
Fat in flesh	16.5	32.4
Fat on kidneys	1.9	3.9
Fat on omentum and intestines	1.7	2.5

Referring to the live animal, he gives the following figures for the percentage composition:

Fat	40.2
Proteine	11.0
Ash	1.8
Water	42.0
Contents of stomach and intestines	5.0

Now all the figures I have given are those abroad, and with animals of European production. They are of value to American breeders and pork producers, but will scarcely be of the same interest as similar figures for American-grown pork. I have therefore taken some pains to secure such data, and by interviews and correspondence with some of the packers of Chicago, have been successful in obtaining the results of experiments in killing, that show nicely the relations of the parts in the American product also. I have received the following from Mr. John C. Hately, of Chicago:

217 AND 166 DEARBORN ST.,
CHICAGO, Sept. 3, 1883

Wm. McMurtrie, Esq., Champaign, Ill.

DEAR SIR—I am sorry I can give you so little information of value to you in preparing your paper on "The Chemistry of the Hog." If the time at your disposal had been greater, I should have had much pleasure preparing a few tests for your guidance. The following may be of some service to you.:

	Per cent.
Offal, hearts, livers, bones, entrails, except the small and bung gut, are made into dried fertilizer, containing about 7 per cent. of ammonia, worth just now 3c per unit or $21 per ton	2.25
Blood made into fertilizer containing 15 per cent. of ammonia, worth just now 3c per unit or $45 per ton	0.75
Small guts used for sausage casings and worth now 30c per pound	0.12
Bung guts do. worth 20c per pound	0.10
Fat (lard, gut fat, and grease)	15.15
Flesh (sides, hams, and shoulders)	57.00

Lean meat, trimmings, tenderloins, hocks, etc., all taken from the sides, hams and shoulders in cutting them into shape necessary to offer for sale on the market	3.50
Tongues 6c per pound	0.35
Total percentage	80.97

Of hair and bristles I have no data for the per cent. of weight. They are sold by packers, at so much a hog, to hair manufacturers. This summer the price averaged 2½ cents per hog. Last winter 10½ cents. The reason for this difference is, winter hogs yield more and stronger bristles and longer than summer ones. Yours truly,

(Signed) JOHN C. HATELY.

Messrs. Geo. D. Baldwin & Co., under date of Sept. 3, say:

The yield of the several parts of the hog depends not only upon the weight, but upon many other things, as the breed, the feed, the health, the age, etc. It does not appear that winter or summer feeding makes any difference in the yield. There never was less waste in hogs slaughtered in Chicago, than during the last four weeks. It is generally true that hogs yield more in winter than in summer, but this appears to be due not to the temperature but to the feed, the amount and quality given.

The distance from which hogs are brought to be slaughtered also affects the yield, other conditions being the same—the greater the distance the greater the percentage of yield.

For the American markets, hog sides are cut in Chicago, for the most part into what are called short ribs or mess pork, and when so cut the yield is about as follows.

	Per cent.		Per cent.
Shoulder	10	Shoulder	10
Ham	11	Ham	11
Lard (rendered)	15	Lard (rendered)	11
Short rib	39	Mess pork	40.5
	75.0		76.5

In addition to the above the following product is secured:

Tenderloin about	1 pound per hog.
Tongue	1 " "
Lean trimmings	1½ " "
Heart	0.25 per cent of live weight.
Feet	1.56 " " " "
Cheeks removed from bone	0.20 " "

The foregoing figures are taken from actual tests made last winter of two lots of hogs weighing alive about 290 pounds of the best quality. We have no tests showing the weight of all the bones, nor the proportion of lean and fat meat.

From 4,811 hogs cut in 1880, having an average weight of 215 pounds, there were made 6,007 pounds of dried blood containing 16 per cent. of moisture; 42,227 pounds of pressed tankage containing 42 per cent. of moisture.

When the shoulders and hams are cut off and trimmed and a butcher's loin made from the side, the loin will make about 9 per cent. of the hog. If the rest of the lard and the fat trimmings be rendered, there will be a yield of lard of about 40 per cent. of the live weight. These figures are taken from a test made recently of 100 hogs weighing 340 pounds.

Both of these letters are full of information and suggestions, and it is to be regretted that those having the facilities for this purpose do not make further tests in this direction, with animals of different breeds and known history as regards all conditions of feeding, management, health, etc.

During the limited time allotted me for the preparation of this paper I have myself endeavored to supply the deficit of information concerning the average composition of American hogs here illustrated. We see that in Germany, France, and England, careful tests have been made in slaughtering to determine the relation between the several parts of the animal, while at the same time chemical analyses have been made of these parts; but we may search the records in vain for anything of like character in this country. I have, therefore, undertaken the slaughter of two animals of good average condition, with the separation of the several parts. The short time remaining in which to make such an experiment, and the haste this involved, prevented that nicety of arrangement and extended detail of preparation that is so desirable in work of the character we have prosecuted in this direction. But we hope the results we have obtained and have to present will not be without interest, and will serve to open the way for further work in the same direction.

In carrying out our purpose we secured two hogs of good average condition, and caused them to be slaughtered. The animals chosen for the experiment were of the Poland-China and Berkshire breeds respectively, and were both females. It was our desire to secure not only of the same breed and sex, but those of the same age similarly fed; but in this particular, as our figures show, we were disappointed. It seemed impossible to secure animals of exactly the same age, but both had been corn fed, and it is therefore to be presumed they had all they could eat and digest. One of the animals, the Poland-China, had been fasted previous to slaughtering, and the other lately fed, but it is believed this could affect only the entrails. They were slaughtered in the afternoon, and all the parts of offal collected as completely as possible. Each part was weighed and the weight recorded. The carcass was then divided into two parts, in the direction of its length, and allowed to cool over night. On the following morning one side was carefully skinned, the fat separated as completely as possible from the flesh, and both from the bones, and all weighed separately. Each part was then chopped into small pieces, and samples taken from each lot for analyses.

The results of slaughtering are as follows:

Constituents.	Poland China. Age, 11 months. Live wt., 340 lbs.		Berkshire. Age, 9 months. Live wt., 245 lbs.	
	Actual weights. Pounds.	Per cent live weight.	Actual weights. Pounds.	Per cent live weight.
Blood	11.5	3.38	6.0	2.44
Hair, etc	2.25	0.66	1.5	0.61
Entrails and contents	17.25	5.07	15.0	6 11
Liver, kidneys, spleen, brain	5.75	1 07	4 75	1.95
Heart, liver, tongue	6.00	1.91	6.00	2.44
Flesh without fat and bones	101.00	29.70	80.00	32.61
Bones (crude)	21.50	6.30	17.50	6 73
Side fat	104.50	30.73	70.00	28 57
Kidney fat	12 00	3 57	8.00	3.26
Fat on entrails	5.00	1 47	3 50	1.43
Skin	17.00	5.06	12.00	4.88
Loss	35.00	10.29	21 75	8 87
Total	340.00	99.21	245.50	99.90

We see by this table that the animals differ in age, and on this account perhaps in weight also. In the percentage figures we find some important differences for the same parts. Thus we find that the Poland-China has nearly one per cent. more of blood than the Berkshire, while as regards the internal organs, those of the Berkshire are 3 per cent. heavier than those of the Poland, when referred to total weight of carcass in each case respectively. In the latter, however, the percentage of flesh is lower and that of fat higher in every part. We have a loss in both cases that can not be accounted for, of 10.29 per cent. in one case, and 8.87 per cent. in the other.

The differences here appear to be in favor of the Poland breed, and these conditions are further supported by the chemical analyses.

In preparing for the latter the several parts were reduced to small pieces and thoroughly mixed. From each lot a sample, sufficiently large to fill a can of one quart capacity, was taken, enclosed in the can, and the latter labeled to indicate the source of the material. From these cans the samples for analyses were drawn. The contents of each can were very thoroughly mixed, about fifty grammes separated and reduced to a finely divided condition, and the quantities needed in each operation of the analysis taken from the material thus prepared.

For the estimation of moisture and oil, from 0.7 to 1.5 grammes was taken from each sample, placed within the tube of the continuous extraction apparatus, and dried with suitable precautions. The loss of weight by evaporation at 110 deg. C. (238 deg. F) was reckoned as moisture. The residue, from determination of moisture with ether in a continuous extraction apparatus, until completely exhausted of fat. The ether solution of the latter evaporated in a small flask, and the residual of fat weighed.

Ash was determined by carefully incinerating 50 to 100 grammes of the well-mixed material in a weighed platinum dish, and the residual mineral matter weighed. Proteine in this case was estimated by difference, because of the difficulty experienced in securing accurate and satisfactory results by the combustion process.

The results obtained in these analyses, expressed in percentage of each part, are given in the following table:

ANALYSES OF DIFFERENT PARTS OF HOGS' CARCASSES.

Breed—Constituents.	Moistu'e	Fat.	Ash.	Proteine
Poland.				
1. Gut fat	9 63	88.39	1.91	2.937
2. Side fat	5.00	92.33	0 0015	2.668
3. Kidney or leaf fat	4.118	93 336	0.0666	1 25
4. Flesh or lean meat	60.53	1>.505	1.232	24 733
5. Bones (crude)	38.655	21 1706	24.808	16 3644
10. Skin	53.32	3.742	0.344	42 594
Berkshire.				
6. Gut fat	19.35	78.61	0.0023	2 04
7. Side fat	8.13	95.846	0.0428	0.9812
8 Kidney fat	1.73	96.425	0 0445	2.8005
9. Flesh	67 30	15.584	0.779	16 837
11. Bones (crude)	40.944	20.883	27.136	10.997
12. Skin	49.380	4.625	0.640	45 715

It must be observed that in the separation of the fat and lean meat more care was taken to prevent leaving meat with the fat than leaving fat with the meat. The proportion of fat in the flesh is therefore considerably higher in this case than obtains in flesh free from large particles of fat. And the same is true of the bones, for while they are separated from the flesh as completely as possible, yet a comparatively high proportion of flesh and fat adhered to them, and so modified the proportions of the constituents shown in our analyses. In the calculation of the proximate composition of the carcass, however, these figures are, we believe, all that are desired.

If from these figures, and those of the preceding table giving the relation of the parts, we make reductions of percentage of moisture, fat, ash, and proteine we have the following results for the dressed carcass:

POLAND CHINA PIG.

Constituents.	Total per cent.	Water.	Fat.	Ash.	Porteine
Flesh	39.453	23.9859	5.32	0.0577	9.728
Bones	8.398	3.151	1.778	2.8832	1.439
Side fat	40.820	2.041	37.689	0.0061	1.089
Kidney fat	4.690	0.193	4.518	0.003	0.0058
Skin	6.640	3.540	0.248	0.0228	2.8282
Total	100.001	32.9100	49.553	2.1728	15.0900

BERKSHIRE PIG.

Constituens.	Total per cent.	Water.	Fat.	Ash.	Proteine
Flesh	42.666	27.714	6.639	0 3823	7.183
Bones	9.333	3.882	1.949	2 5226	1.026
Side fat	37.333	3.035	33.915	0.0159	0.367
Kidney fat	4 266	0.6738	4.070	0.0018	0.119
Skin	6.400	3.1603	0.296	0.0409	3.325
Total	99.998	38.8657	46.869	2.9135	12.020

We have here the means for comparing not only these two animals as regards their composition, but through the intervention of published analyses, with foreign animals as well. In the Berkshire which had the lowest live weight and was two months younger than the Poland-China we find a higher percentage of flesh and a generally lower proportion of side and other fat. We find also that the proportion of water is higher and the total or pure fat lower, as might very naturally be expected, perhaps. But it is interesting to note that in the animal in which the proportion of flesh ranged higher than in the other the proteine substances are considerably lower, and this is an important point in the determination of the nutritive value of the product. We find it lower, not only in the carcass as a whole, but in both the flesh and side fat as well, the two parts used in the crude condition for immediate consumption.

In the skin the porteine is higher, but this is probably only an evidence of the fact that the fat was more completely removed in one case than in the other, yet the higher fat and higher proteine both occur on the same side.

If then we have our standard of composition upon the relative percentage of proteine, it appears that the Poland pig is of decidedly greater value for food supply, while the same is true if we base our estimate upon the proportion of fat. What changes the Berkshire might undergo in an additional two months of growth, feeding and fattening, we have no means of knowing, and it would be manifestly unfair to base definite comparison of the breeds upon these figures. Further analyses are necessary to confirm or deny the relations here set forth.

But it would seem doubtful if this animal could have gained the additional 100 in live weight during the period named, or change the proportion of proteine from 2 to 15 per cent. Yet it is possible.

We may now compare these figures for Illinois hogs with those o a similar character obtained in analyses of hogs of England and Germany. For the former we are indebted to Lawes and Gilbert, and for the latter to Dr. Wolff.

Constituents.	English. Lawes & Gilbert.		German. Wolff.		American. McMurtrie.	
	Store Pig.	Fat Pig.	Well Fed.	Fat.	Poland.	Berkshire.
Water	58.1	43.0	57.9	43 9	32.9	38 8
Fat	24 6	43.9	24 2	42 3	49 5	46.8
Ash	2.8	1.4	3.9	1.9	2.4	2 9
Proteine	14.5	11.4	15 0	11.9	15.3	12 0

And we see that the American and Illinois product suffers none by the comparison. But it is held by foreign authorities, and justly it may be, that American pork suffers more by shrinkage in cooking than the foreign product, and Brady states (Pavy on Food) that in cooking, American pork loses 50 per cent., while Irish pork loses only 25 or 30 per cent. But this is to be ascribed to the higher proportion of fat it contains, as appears from the figures of our analyses of American bacon as compared with those given by Pavy (Food, p. 155), for fat pork, dried and green bacon. The bacon for our own analyses was secured from a grocer and was said to have been prepared in Indianapolis. One sample was pickled by immersion in salt solution or brine apparently, and smoking; the other was the best quality of sugar-cured bacon. In preparation for analysis two slices were cut from a side of bacon and these were cut in very fine strips transversely with good shears, then the whole sample was further reduced by chopping and pounding until a finely divided condition was attained. Finally it was subjected to analysis after the same manner and with the same methods as the pork already described. Our results and the figures given by Pavy are shown in the following table:

Constituents.	M'Murtrie.		Pavy.		
	Sugar Cured Bacon.	Pickled Bacon.	Fat Pork	Dried Bacon.	Green Bacon.
Proteine	27.871	1.450	9.8	8.8	7.1
Fat	56.860	84.720	48.9	73.3	66.8
Ash	5.175	3.365	2 3	2.9	2.1
Water	9.174	10.383	39.9	15.0	24.0

Surely the objection urged against American pork in the English publications can not apply to the sugar-cured bacon. Here the proportion of proteine is three-fold higher than in the English, and the

water about 25 or 30 per cent. lower. The fat is also lower—but the relations here occurring are due to the fact that the sample represented contained a very high proportion of flesh. In the ordinary green Indianapolis bacon we have a very low proportion of proteine, as compared with the other samples, but the water is not materially higher, and the difference in proteine is largely compensated for in the increased proportion of fat. Yet when we compare the English fat pork with the American product of apparently the same grade, e. g. our fat and green bacon or our side fat, it is evident that the proteine content is relatively higher, and the differences are doubtless due to the systems of feeding, or rather to the character of food supplied abroad. Here, corn is the staple food, and for the pork of commerce almost the exclusive food. Abroad, barley, peas, beans or rye, and other materials, enter into the rations of the growing and fattening animal, and if we examine the statements of analyses showing the composition of the resulting products, we find them to contain higher proportions of the nitrogenous principles, or proteine, than corn, and it is believed by the best authorities that an increased proportion of proteine in the animals fed on these materials may be due to this fact. But whether it be true or not, so high an authority as Prof. Sanson, of the Agricultural School at Grignon, in France, believes that the addition of such nitrogenous seeds as peas and beans to the rations of hogs greatly improves the quality of the pork. There can, therefore, be scarcely a doubt that, if such material were added to the corn rations of American hogs, the pork would be enhanced in value accordingly.

But it will not only enhance the value of the product; it will increase the quantity as well. If we compare the relations between the proteine and carbohydrates with that in the other products named, we find it to range 1:8 in the former and 1:2.5 or 3.0 in the latter (peas and beans). We know that too great a preponderance of one constituent over the other diminishes the digestibility of both, and causes loss. Fortunately we have definite experiments on which to base our conclusions with this regard, and their results have shown that not only may an improved quality of product be obtained by establishing a proper relation between these constituents, but, with the same quantity of food consumed, there will be a more rapid increase in weight. For the detailed results of these experiments I must refer to Armsby's excellent "Manual of Cattle Feeding," in which these experiments are fully described.

Wolff concludes, from all experiments that have been made, that the following are the best standards for the composition of the rations of growing and fattening pigs:

Condition of Animals.		Quality of Food.				
Age. Months.	Live weight lbs.	Total Organic Substances.	Digestible Substances.		Total Nutritive Substances.	Nutritive Ratio.
			Albuminoids.	Carbohydrates.		
2-3	50	2.1	0.38	1.50	1.88	1:4
3-5	100	3.4	0.50	2.50	3.00	1:5
5-6	125	3.9	0.54	2.96	3.50	1:5.5
6-8	170	4.6	0.58	3.47	4.05	1:6
8-12.....	250	5.2	0.62	4.05	4.67	1:6.5

Wolff recommends beginning with a nutritive ratio of 1:5.5 and widening to 1:6.5 toward the end of the feeding period.

It will naturally be asked, how are American pork-producers to obtain this proteine to add to the rations without too greatly increasing the cost of production? and in this connection we may suggest either the culture of peas or beans, or the use of some of the refuse products of the packing establishments, especially the dried blood. When carefully prepared, it is in excellent condition for feeding, and is readily digested by hogs. The rules for calculating the rations according to these proportions or ratios will be found in the work already mentioned, which contains tables showing the composition of various materials available for food.

These relations are important and worthy of consideration by all growers of pork, as well as those engaged in the commerce of the product. The addition of even 1 or 2 per cent. to the quantity of the product would add thousands, and even millions of dollars to the revenues of the industry, while the improvement of the quality that would follow would increase them to a corresponding extent.

I have also been asked to treat of the "quality of pork best suited for food for man, and the chemical changes or causes affecting and impairing the quality of pork," but I feel that I have occupied too much time already. I have touched upon these points to some extent, but the relations have never been studied to that extent that will enable me to present much of general interest. We have shown that the increase of proteine of pork will improve its quality for immediate consumption, and render it more nutritious. We have shown in the opening remarks that lean meat or muscular fibre, by reason of the acid reaction it acquires, and the presence of the small proportion of pepsin, may become more tender and digestible by breaking down the myosin, but we have not yet alluded to the influence of the methods of preservation upon its quality. This may not be done in extent now, but we may not leave the subject without recalling the fact that the digestible albuminoids of flesh are very soluble in solutions of salt, and that the use of this agent as a preservative must tend to diminish the digestibility and nutritive value of the flesh to a corresponding extent. The hardening of the fibres by salt also diminishes their digestibility, and hence the flesh should be, as far as possible, consumed in a fresh condition. On the other hand, putrefaction is to be carefully avoided. While it is not always the case, it not unfrequently happens that virulent poisons of an

organic character are developed in the putrefactive decomposition of pork and other flesh, and many of the fatal results apparently attending its consumption may be referred to this cause rather than to the trichinæ to which the injurious consequences of pork consumption are so often ascribed. The consideration of the latter must be left to the entomologist and veterinarian.

Ice, or at least a low temperature, is therefore the best preservative, though the partial cooking and smoking employed in many of the packing establishments may effect the desired result when carefully applied, and indeed, from a chemical standpoint, it seems that no objection can be raised against it. It prevents putrefaction without reducing the digestibility of the product to any marked degree.

The whole subject of the relation of the composition of pork to its nutritive value requires further study, and I hope at some future time to be able to present the results of some additional investigations in this direction. What I have the pleasure to present here is only a beginning of what should follow, and I hope it may have a tendency to stimulate inquiry in the same direction in other quarters.

In conclusion, I desire to acknowledge the valuable aid I have received in connection with my work at the hands of Messrs. Baldwin & Co., J. C. Hately & Co., and Armour & Co., of Chicago, in the information furnished concerning the results obtained in their packing establishments, and that rendered by my assistants, Messrs. A. W. Palmer and F. W. Eberlein, also students Miller, Mann and Ellis in making the analyses in the Laboratory of the Illinois Industrial University.

[*For supplementary Paper on Chemistry of the Hog, see "Appendix."*]

PROCEEDINGS OF THE BOARD.

MEETING OF THE BOARD OF TRUSTEES, DECEMBER, 1882.

The Board met at 3 P. M., December 12, 1882, in the University parlor.

Present: Governor Cullom, Messrs. Mason, Millard, McLean, Kenower, Pearman and Scott,

Absent: Messrs. Cobb, Bennett and Paden.

Mr. Geo. F. Kenower, newly appointed member of the Board, took the oath of office, administered by Hon. W. A. Day.

The record of last meeting was read and approved.

The following report of the Executive Committee was received:

Meeting of the Executive Committee at the Doane House, Champaign, October 27, 1882.

Present: Messrs. Cobb, Scott and Pearman.

Major Pearman, of Nebraska, appeared before the committee and made certain statements concerning the lands owned by the University and situated in Gage county, Nebraska, and making an offer for the purchase of those lands.

After hearing the statements of Major Pearman, on motion of Mr. Scott, seconded by Dr. Pearman, it was ordered:

That the Regent be authorized to advertise the lands owned by the University in Gage county, Nebraska, for sale, for cash, or for one-third cash, the remainder to be paid in three equal installments at the end of one, two and three years respectively, with interest payable annually, at seven per cent. Bids to be required for all the lands owned by the University in said county. The Trustees to reserve the right to reject any or all bids.

Bids to be directed to the Regent of the University, at Urbana, Ill., and to be received on or before four in the afternoon of the twelfth day of December next.

After which the committee adjourned.

EMORY COBB,
JAS. R. SCOTT,
J. T. PEARMAN,
Committee.

The Regent then read his report, which was received and laid on the table:

To the Trustees of the Illinois Industrial University:

GENTLEMEN: The first term of the current college year is rapidly passing away. It has been marked by an attendance equal in numbers to that of the entire year preceding, and not surpassed in the number of matriculated students, members of University classes, in any year of the University's existence. In character and calibre the students who have come to us this year are such as will help to elevate the standards of excellence. An analysis of the attendance during all the years since the organization of the University in 1868, as found in the accompanying table, shows the steady and continuous progress which has been made, year by year advancing from the elementary work of a high school or academy to the more advanced duty of a technical school of high aims and of established success.

Attendance at the University by Years and Classes.

Year ending.	1st year students.	2d year students.	3d year students.	4th year students.		Resident graduates	Special students.	Total catalogue	University students.
June, 1869	128	.....	.....	.....	.....	.....	.....	128	.....
1870	180	.....	.....	.....	.....	.....	.....	180	.....
1871	169	81	28	.....	.....	.....	.....	274	109
1872	247	92	29	13	.....	.....	.....	381	134
1873	233	109	42	16	.....	.....	.....	400	167
1874	182	119	74	30	.....	.....	.....	405	213
1875	155	109	60	44	.....	.....	.....	308	213
1876	159	96	71	44	.....	.....	.....	370	211
	Prep'y.	Fresh'm	Sopho.	Junior.	Senior.				
1877	114	93	77	56	42	3	3	388	268
1878	129	98	57	44	45	10	4	387	244
1879	140	78	78	51	25	11	17	399	232
1880	131	104	59	70	26	8	16	414	259
1881	77	116	78	47	50	3	11	382	291
1882	71	87	91	49	35	9	10	352	262
Fall term, 1882	70	111	68	59	37	5	.....	350	275

The table shows that the number of students of preparatory grade has diminished from 247 in 1872, to 70 in 1882; while the number of University students has increased from 109 in 1871, to 275 in 882. During the last ten years the aggregate attendance has never exceeded 414, and never fallen below 352.

At present, 59 counties are represented here. Since the organization, every county of the State has been represented except six—Crawford, Gallatin, Lawrence, Massac, Monroe and Saline. About 23 per cent. of the students are reported from Champaign county, a very considerable number of these being from families who have removed hither from other parts of the State for the express purpose of seeking the benefits of this institution. The proportion of

students from Champaign county will be found to be no greater than the proportion of the expense of organization and endowment which that county has paid into the treasury of the University.

The occupations of those who send to the University, so far as they have been ascertained, have been, from the beginning, as follows:

From parents occupied in agricultural pursuits, including farmers, nurserymen, stock-raisers, etc..... 52 %
From parents occupied in mechanical pursuits, including workers at trades, laborers, miners, etc..... 12 %
From parents occupied in mercantile pursuits, including wholesale or retail dealers, agents, bankers, etc..... 23 %
From parents occupied in professional pursuits, including teachers, physicians, lawyers, clergymen, etc..... 13 %

This institution is emphatically the haven of the needy student who seeks the privileges of a higher intellectual training. Without question, three-fourths of our students either support themselves or come from homes where the yearly income is seriously diminished by the effort to send one or more away for instruction.

It is still farther worthy of note that a sound technical education in agriculture, in mechanics, in architecture, in engineering, in chemistry, in pharmacy, in veterinary science, may be secured at this Univercity, at an aggregate cost for fees paid into the college treasury, for a four years' course, of $105; while a similar course of study would cost the Illinois student at Ann Arbor $145; at Cornell, $300; at the Sheffield School at New Haven, or the Steven's Institute at Hoboken, $600, and at the Columbia School of Mines, at New York, or the Institute of Technology, at Boston, $800. As to the instruction given, it may seem presumption to claim equality with schools of greater age and of vastly greater wealth; but we may remark, without overstepping the bounds of modesty, that whenever it has happened that our students have left us to go to schools named in the list above, they have, in every case, been admitted to classes of grade even with those they occupied with us, and they have graduated honorably without loss of time.

The students who have matriculated at this University have chosen courses of study as follows:

	From the beginning.	Present year.
In the College of Agriculture	13 per cent.	6 per cent.
College of Engineering	24 per cent.	29 per cent.
College of Natural Science (chemistry, &c.)	10 per cent.	16 per cent.
In Elective Scientific courses	13 per cent.	11 per cent.
Total in Technical courses	60 per cent.	62 per cent.
In the College of Literature and Science	32 per cent.	35 per cent.
Commercial, Special and Resident Graduates	8 per cent.	3 per cent.

The ratio of women in attendance is about 20 per cent.; from the beginning 18.4 per cent. Of these about one-twentieth, or 1 per cent of the aggregate of students, have taken technical courses. If, then, we deduct from each of the great divisions of students,

the proper proportions of women, it appears that of all the men who have been matriculated, 74 per cent. have taken technical courses, and 18 per cent. literary courses; and that of the men now in attendance 78 per cent. take technical courses, and 20 per cent. literary courses.

A more just and equable application of the resources of the University could hardly be devised. It meets in the letter and in the spirit, that requirement of the congressional act, when it ordains that the "leading object of the University shall be to give instruction in Agriculture and the Mechanic Arts, without neglecting other scientific and classical subjects." It should not be forgotten, that in the harmonious working of these two systems, side by side, the technical students acquire a certain invaluable share of literary culture, while the literary students possess unusual facilities for a good proportion of scientific training. Both classes find advantages which must be denied them in institutions less thoroughly equipped.

The occupation of graduates, so far as known, is as follows.

In Agricultural pursuits	20 per cent.
Technical pursuits	35 per cent.
Mercantile pursuits	16 per cent.
Professional pursuits	28 per cent.

It is too early yet to generalize upon this point. Many of our graduates are yet employed provisionally, at occupations which offer temporary support while preparations are completed for undertaking the real work to which they will ultimately devote their energies and their education.

It appears to me that the facts presented above in a condensed form, are such as must convince candid minds that this University has been, and is now, doing with unswerving fidelity the work which lies in its legitimate province. That it has earned, and therefore deserves, the confidence of the people, and the support of those who are entrusted with the management of the people's affairs.

The question of paramount importance at this time, one which overshadows all others by the dangers with which it menaces present welfare and future prosperity, is the question.

How shall this work be carried forward?

I have prepared from the printed reports of the proceedings of this board a tabulated statement showing the yearly income of the endowment fund, sacred as you know to the payment of the salaries of instructors, the yearly aggregate sums paid to professors and teachers; and the yearly aggregate sums paid for all expenses, save such as were paid from legislative appropriations made for specific purposes.

Year Ending	No. teachers.	Students, University.	Students, total	Aggregate salaries	Income from endowment.	Total expenses other than Legislative.
March—						
1869	10	.....	128	$14,840 30	$20,450 00	$36,715 56
1870	16	.....	180	18,327 75	24,390 00	33,246 30
1871	16	109	274	20,576 42	26,640 00	37,923 26
1872	21	134	381	20,473 58	26,894 00	44,866 05
1873	24	167	400	25,433 87	28,680 00	46,156 30
March to September—						
1873	.....	.....	.....	12,649 10	21,055 00	27,384 23
September—						
1874	25	213	405	27,731 01	27,710 00	45,048 47
1875	25	213	368	30,833 63	27,710 00	45,971 71
1876	27	211	370	35,314 90	32,543 50	44,369 88
1877	26	268	385	33,921 94	29,368 25	44,350 61
1878	29	227	387	29,556 56	25,695 00	43,163 38
1879	30	232	399	29,779 30	20,470 00	37,399 32
1880	29	259	414	28,775 89	19,598 40	34,084 22
1881	26	291	382	26,402 53	20,960 00	36,293 46
1882	26	262	352	29,898 22	19,335 00	31,362 44
1883	.....	.....	.....	.....	15,721 00	.....

From the above table it will be seen:

First—That the income increased gradually as the land-scrip was sold, and the proceeds were properly invested, from $20,450, in 1869, to $29,368.25 in 1877; that it has since then steadily decreased until in 1882 it has become $19,335, and in 1883 the endowment, as it now stands, will yield but $15,721. The depreciation in interest within the last six years amounts to $13,668.25. This depreciation, it will be understood, represents no malfeasance on the part of the Trustees or of other officers of the University, but comes from well known causes, which have reduced the current rates of interest on first-class securities from ten per cent. per annum to four or five per cent., with a still downward tendency.

Second—It will be seen that the sums paid for salaries have varied from $14,840.30 in 1869, when the institution was organized, to $35,-314.90 in 187 , thence descending to $29,898.22 in 1882. It will be remembered that the first salaries were, in most cases, wages given ot young men whose futures were yet to be created, and who were induced to join their fortunes to those of the University by the promise that their fame, and their wages as well, should grow as the enterprise prospered. I need not explain to you, as I might be required to show those less familiar with these details, the work of these men, their fidelity, their growth, their deserts, or the meagreness with which you have been compelled to reward them not according to their merits. Some thing must be done to bring the wages of our professors up to the standards which such men secure, east and west.

Third—It will be seen that the general aggregate of expense, which began at $36,715.56 in 1869, became $44,865.05 in 1872, and did not vary from that amount by more than $1,500 in any year until 1877, when it was $44,350.61. Since that date it has been constantly reduced until in 1882 it was but $31,362.44. This certainly shows

with what care, discretion, and fidelity the finances of this institution have been administered, and that the Trustees and all officers concerned have fulfilled their duties with the utmost economy.

The expenses for the year ending Sept. 1, 1884, are estimated as follows:

Salary of Regent		$3,000
10 Professors @ $2,000		20,000
1 Professor @		1,800
2 Professors @ $1,500		3,000
2 Instructors @ $1,200		2,400
1 Instructor @		1,000
3 Instructors @ $750		2,250
		$33,450
Current expenses.		
Board expenses	$500	
Fuel and Lights	3,200	
Printing, Advertising, Stationery and Postage	1,400	
Janitors and Firemen	1,500	
Sundries	500	
		7,100
Total expenses		$40,550
The income from sources in control of the University:		
Interest from endowment	$15,721	
From fees and profits	10,000	
Ill. Central freight donation	1,000	
		26,731
Leaving deficit to be supplied		$13,819

This, it will be remembered, will provide merely for maintaining things as they are, and will make no provision for such progress as an institution like this will be reasonably expected to make before a critical and exacting public.

The committee to whom you referred this subject at your last meeting has carefully considered this question, and I ask for their report your most thoughtful attention.

THE NEBRASKA LANDS.

At a late meeting of the Executive Committee, of which a report will be presented to you, the Regent was instructed to advertise for proposals for the purchase of the lands belonging to the University, and lying in Gage Co., Nebraska. The lands were accordingly offered for sale, as by the terms of an advertisement communicated herewith. The offers are to be made on this day, and will be laid before you as you shall direct, together with all accompanying documents.

The current work of the University may be learned from the following table, which shows for each instructor the kind of duty, number of classes, and of hours, and the number of students attending, both male and female. It shows that twenty-two teachers of all grades, teach 66 classes per diem, and that the average time in the class room is 19 hours per week, or 3.8 hours per day. This schedule does not show the time employed by many of the same persons in other official studies of scarcely less importance.

Work of Instruction during term ending Dec. 20, 1882.

Instructor.	Subjects taught.	No. of classes.	Hours per week.	No. of students.		
				Male.	Female.	Total.
S. H. Peabody	Men. Sci. and Hy. Re. M.	2	10	24	12	36
T. J. Burrill	Bot. and Horticulture	2	11	7	3	10
S. W. Shattuck	Mathematics	3	15	69	13	82
E. Snyder	Modern Languages	6	30	138	57	195
J. C. Pickard	Eng. Lit. and Anglo-Sax	4	20	47	53	100
N. C. Ricker	Architecture	2	20	9		9
J. D. Crawford	History and Latin	5	25	34	34	68
G. E. Morrow	Agriculture	2	20	15		15
F. W. Prentice	Veter. Sci. and Physiol.	3	15	31	15	46
P. Roos	Free Hand Drawing	3	20	20	20	40
W. T. Wood	Military Science	2	4	23		23
I. O. Baker	Civil Engineering	3	30	41		41
C. H. Peabody	Mech. Engineering	4	22	65	12	77
W. McMurtrie	Chemistry and Mineral.	8	25	92	16	108
B. C. Jillson	Geol. and Phys. Geog	2	10	29	3	32
E. A. Kimball	Mach. Shop Practice	2	20	29		29
N. S. Spencer	Wood Shop Practice	2	10	10		10
J. Sondericker	Drawing and Math's	3	25	101		101
C. W. Rolfe	Prep. Alg. and Physiol.	4	20	96	10	106
E. P. Morse	Latin and Greek	4	20	11	7	18
H. Slawson	Asst. in Chem. Lab'y		25			
A. W. Palmer	Asst. in Chem. Lab'y		20			

Prof. Wm. McMurtrie brings to the chair of Chemistry great zeal, earnestness, and efficiency. The circumstances connected with the vacation of the chairs of chemistry at the end of last year, have left great difficulties to be overcome by the new incumbent, whoever he might be. When time and tact shall have softened these asperities, I am confident that the department of Chemistry will be found to have acquired a vigorous and healthy stamina, very greatly to be desired. The chemistry of to-day is an exact science, as precise as mathematics and as positive as engineering.

Prof. B. C. Jillson has made a good beginning in the department of Geology and Zoölogy.

The lady appointed at your last meeting did not accept the position offered her; and I have secured for the present year the services of Mr. Edward P. Morse, a graduate of the University of Vermont. I hope to arrange satisfactorily for the appointment of a lady in this position at the end of the current year.

The departments of Civil and Mechanical Engineering are showing unusual activity. The new observatory with the large theodolite has aroused much interest among the civil engineers, who are doing work of great excellence. The mechanical engineers have so filled the shop that it is difficult to furnish to advanced men the proper machine tools for carrying on the practice required from them. The erection and equipment of the blacksmith shop and foundry is a great necessity, as well as the addition of tools in the machine shop.

The condition of the departments of Agriculture and of Horticulture will be shown by the reports of the professors in charge, which reports are presented herewith.

Agreeably to your instructions, a set of books has been prepared to contain the inventories of the several departments, and in most of them the inventories have been written up in a permanent form. A certain amount of incompleteness remains, which I hope to have corrected at an early day.

The results are shown in the following table, making a grand total of $127,287.74, of which $7,259.50 belong to the U. S. Government, and is deposited here for use, mostly under bonds for safe keeping and return when required. Deducting this sum, the movable property of the University amounts to $120,028.24.

Inventory of Apparatus, Library, Machinery, and other movable property belonging to the—

Department of—	Value of enumerated articles.	Estimated value of other articles.	Value of articles loaned by U. S. Gov't	Total values.
Agriculture	$3,402 15	$12,363 00	$73 00	$15,838 00
Horticulture and Botany	1,135 00	2,744 25	.....	3,880 10
Mechanical Engineering	7,548 00	761 04	52 00	8,361 04
Architectural	2,541 48	1,202 00	.....	3,743 48
Civil Engineering	2,570 90	.....	79 50	2,650 40
Physical Laboratory	4,715 85	100 00	.....	4,815 85
Chemical Laboratory	.....	16,021 19	.....	16,021 19
Blue Printing Laboratory	48 50	29 78	.....	78 28
Museum of Natural History	6,430 00	1,400 00	.....	7,830 00
Library	27,426 00	.....	.....	27,426 00
Art Gallery	3,084 10	.....	.....	3,048 10
Art and Design	.....	500 68	.....	500 68
Military and Gymnasium	688 00	65 00	7,055 00	7,808 60
Furniture, etc.	.....	3,250 62	.....	3,250 62
Heating Apparatus.	.....	23,000 00	.....	23,000 00
Total inventory	.....	.....	.....	$127,287 74
Belonging to U. S. Gov't	.....	.....	.....	7,259 50
Total belonging to University	.....	.....	.....	$120,028 24

I present the petition of the literary societies asking for more light in their halls, and approve its request.

I present a communication from the Commissioner of the Agricultural Department at Washington, asking that you will appoint delegates to conventions called by him to sit at his office in the last week of January next. The conventions which will most nearly concern this institution are those which will consider the needs of the agricultural colleges, and of the stock-growing interests.

All of which is respectfully submitted.

SELIM H. PEABODY, *Regent.*

Mr. Millard moved that the bids on Nebraska lands be now opened before the bidders present. Carried.

The following ten bids received were opened:

1. Bowdle & Newcome, Eldora, Iowa, $6.43 per acre.
2. John Ellis, Beatrice, Nebraska, $5.65 per acre.
3. W. E. Haywood, Pana, Ill., $4.14 per acre.
4. C. C. Burr and T. S. Sheldon, Lincoln, Neb., $6.05 per acre.

5. H. B. Scott, Peoria, Ill., $6.02 per acre.
6. Ford Lewis, Peoria, Ill., $4.86 per acre.
7. J. H. McMurthrie, Lincoln, Nebraska, $5.25 per acre.
8. John D. Knight, Lincoln, Neb., $5.55 per acre.
9. Emile C. Dremush, Jerseyville, Ill., $5.13 per acre.
10. John G. Zeller, Spring Bay, Ill., $4.50 cash or $5.15 time.

On motion of Dr. Pearman, seconded by Mr. McLean, it was resolved, that all bids this day received and opened for the purchase of Nebraska lands, be refused and rejected.

Adjourned to 7:30 P. M.

EVENING SESSION.

Board met as by adjournment. Present as before.

The Executive Committee presented the schedule of appropriations to be asked from the Legislature. The report was accepted, the recommendations approved, and the Regent was instructed to present the same in proper form to the Governor and Legislature.

The Treasurer's report was read, received and referred to the Auditing Committee.

ILLINOIS INDUSTRIAL UNIVERSITY,

To John W. Bunn, Treasurer.

1882.	Cr.		
Sept. 13	By balance		$13 519 41
30	" amount received on acc't fees		3,000 00
30	" " " " Tuition in Preparatory Dept		410 00
Oct. 1	" interest on Douglas county school bonds		300 00
Nov. 1	" " Champaign county bonds		3,066 67
30	" amount received on acc't Horticultural Department	$114 12	
	" " " " Agricultural Department	3,049 71	
	" " " " Mechanical Department	298 36	
	" " " " Architectural Department	882 95	
	" " " " Chemical Department	135 00	
	" " " " Physical Laboratory	15 00	
	" " " " Music	75 00	
	" " " " Tuition in Preparatory Dep.	45 00	
	" " " " Fees	233 00	
	" " " " Buildings and Grounds	179 58	
			5,027 72
			$25,320 80
Dec. 12	By balance	$10,471 44	

1882.	Dr.		
Nov. 30	To amount paid salaries	$3,509 22	
	" " " on account Board expense	302 59	
	" " " " buildings and grounds	668 56	
	" " " " fuel and lights	192 15	
	" " " " stationery and printing	141 69	
	" " " " furniture and fixtures	21 34	
	" " " " Mechanical Department	416 36	
	" " " " Architectural Department	624 86	
	" " " " Agricultural Department	1,878 95	
	" " " " Horticultural Department	196 52	
	" " " " Chemical Department	206 24	
	" " " " Military Department	11 35	
	" " " " Library and apparatus	27 67	
	" " " " Incidental expenses	47 88	
	State appropriations—		$8,245 38
	To amount paid on account buildings and grounds	$162 13	
	" " " " Chem., Phys. and Bot. Labs.	737 73	
	" " " " Mech. and Arch. shops	560 00	
	" " " " books and publications	190 70	
	" " " " current expenses	4,196 64	
	" " " " cabinets	32 06	

	Dr.—*Continued.*		
1882.			
Nov. 30...	To amount paid on account engineering instruments.....	$224 04	
" " " "	heating and ventilation.....	55 18	
	Sundries—		$6,158 48
	To amount paid on account Physical Laboratory.....	50	
" " " "	music fees	$75 00	
" " " "	tuition in Preparatory Dept..	370 00	
			445 50
	To balance.....		10,471 44
			$25,320 80

URBANA, December 12, 1882.

JOHN W. BUNN, *Treasurer.*

The Business Agent submitted his report, which was accepted and referred to the auditing committee:

Current Appropriations.

September. 1882, to December 1st, 1882.	Appropri't'd	Receipt also approved.	Expended.	Balance.
Board expense.....	$555 62	.....	$302 59	$253 03
Salaries.....	12,000 00	.....	3,509 22	8,490 78
Stationery and printing.....	300 00	.....	141 69	158 31
Fuel and lights.....	2,000 00	.....	192 15	1,807 85
Buildings and grounds.....	292 63	$179 58	668 56	.....
Fixtures and furniture.....	110 00	.....	21 34	88 66
Library and apparatus.....	50 00	.....	27 67	22 33
Incidental expense.....	200 00	.....	47 88	152 12
Military department.....	50 00	.....	11 35	38 65
Mechanical "	202 32	298 36	416 36	84 32
Architectural "	74 86	882 95	624 86	332 95
Agricultural "	2,417 35	3,049 71	1,878 95	2,588 11
Horticultural "	59 14	114 12	196 52	.....
Chemical "	117 82	135 00	206 24	46 58
Sundries—Physical laboratory.....	30 96	15 00	50	45 46
Cabinets.....	9 45	.....	.....	9 45
Students' government.....	25 00	.....	.....	25 00
Examination of schools.....	25 00	.....	.....	25 00
Music fees	.....	75 00	75 00	.....
Students' fees, Univ.....	.....	3,233 00	.....	.....
Tuition, prept. year.....	.....	455 00	370 00	85 00

State Appropriations.

From July 1st, 1881.	Appropriated.	Received.	Expended	Balance.
Taxes on lands ½ per annum.....	$5,000	$4,460 57	$4,460 37	.....
Buildings and grounds, per annum.....	5,000	5,000 00	5,016 21	.....
Chem., Phys. and Bot. Labs., per annum.....	1,600	1,600 00	1,444 29	$155 71
Mech. Arch. shops, per annum	3,000	3,000 00	2,199 49	800 51
Books and publications, per annum.....	3,000	3,000 00	1,813 93	1,186 07
Current expenses, per annum	11,400	11,400 00	9,896 00	1,504 00
Library cases.....	800	800 00	800 00	.....
Cabinets.	1,000	1,000 00	515 80	484 20
Engineering instruments.....	1,000	1,000 00	1,110 98	.....
Furniture.....	1,000	1,000 00	1,000 00	.....
Boiler house	5,000	5,000 00	4,941 32	58 68
Heating and ventilation.....	2,500	2,500 00	2,479 95	20 05
Farm cottage dairy	1,000	1,000 00	1,000 00	.....

The Regent was authorized to have his biennial report to the State Superintendent of Public Instruction printed, expense not to exceed $50.

The report from Prof. Morrow, for the Agricultural Department, was read, received and ordered on file:

UNIVERSITY, December 11, 1882.

Dr. S. H. Peabody, Regent:

DEAR SIR—The financial results of the year's work on the University farms are shown by the following summary:

Sales and credits	$8,548 46	
Expenses	7,548 33	
Surplus of sales		$1,000 13
Salable property, December 1, 1882	$12,419	
Salable property, December 1, 1881	11,920	
Increase		499 00
Value of teams, December 1, 1882	$1,400	
Value of teams, December 1, 1881	1,000	
Increase		400 00
Value of machinery and tools, 1882	$1,846 25	
Value of machinery and tools, 1881	1,764 50	
Increase		81 75
Increase for year		$1,980 88

The credit balance could be handsomely increased by legitimate charges for improvements made during the year, including sheds, fencing, tile drainage, pump, cistern, etc., and for extra cost of labor in experimental work and of animals purchased for experimental feeding, but it is preferred to have the account as given.

Summaries of the leading items of sales and expenses are given herewith, as also summary of the inventory of property. Detailed statements with vouchers for all expenditures are on file. Care has been taken to make the valuation as accurate as possible. In some cases exact quantities could not be determined—notably of corn in field—but it is believed the total valuation is within, rather than above, the selling value at present prices.

The season as a whole has not been a favorable one. The cold, wet spring and early summer prevented the planting of the full acreage intended for corn, greatly increased the cost of cultivating the crop, and reduced the yield, although this was better than was thought possible a few months since. Most kinds of farm work have been done at greater cost and at later date than in former years. It is probably unprecedented in the history of the farm that there should be 50 acres of corn unhusked at December 1, but it has only been by careful hand-picking, rejecting the more immature ears, that we have been able to secure as much as has been harvested.

We have not been fortunate with the breeding stock. Without any epidemic, our losses from disease and accident have been greater than usual, while the additions have been fewer than was to have been expected.

On the other hand, the yield of small grains was satisfactory, and that of hay unusually good. The pastures have been in good condition during the season.

The efforts to improve the quality of the breeding and fattening stock are thought to have been quite successful. The stock of all classes is believed to be more valuable than at any former time.

The Dairy has been satisfactory. The sales of butter and milk aggregate $708.25 for the year. In addition the partially or wholly skimmed milk has been used in rearing the calves. The butter made has been of good quality. It has largely been sold to members of the Faculty and to the Doane House in Champaign.

Experiments have been tried in feeding cattle and pigs; in comparison of modes of cultivation of corn and tests of some twenty varieties; with commercial fertilizers; in the series to compare effects of rotation with continuous cultivation of one crop, etc. Detailed statements of these will be made.

A Silo has been filled this Autumn, corn, sorghum, artichoke tops and broom-corn seed each being used. Repeated breakage of the cutting apparatus interfered with the plan made for this experiment.

A large trade in seed corn was had last Spring—the sales aggregating $967.65. Such sales seem to me especially appropriate, and I have had careful selection of seed made this Autumn. We will also be able to furnish good seed oats.

The demand for breeding stock continues good, although the limited number for sale has not justified advertising. During the year a large quantity of work has been done in placing the hedge and other fences in good condition, a work that is comparatively nearly completed.

Work on repairs and rearrangement at the barns, commenced last Summer, has been delayed in completion, partly because of pressure of work in the Architectural Department and partly because of attempt to have much of it done by the farm force when leisure could be found. Some could not be done until the weight of hay had been removed.

Prof. Burrill's report was presented, read and ordered on file:

INDUSTRIAL UNIVERSITY.

Dr. S. H. Peabody, Regent:

The work in the Horticultural Department for the year just closed has been reasonably satisfactory, though the season has in many respects been unfavorable. The long drouth of 1881, together with the warm and humid autumn, caused most plants to go into their winter's rest in poor condition. Nearly all the apple-trees in the country became diseased—the peculiar conditions favoring the extraordinary development of a not uncommon fungus parasite which in the autumn, spring and summer severely injured the young shoots, leaves and fruit. Many trees remained throughout the summer with impaired foliage, often appearing half dead, and the small amount of fruit escaping other vicissitudes became nearly worthless from "scab," as the effect of this fungus is popularly called. Pear-trees similarly suffer from the same cause, but with us not so badly this year. An account of my investigations upon this destroyer—*Fusicladium dendriticum*, Fckl., has been published in the American Agricultural Review, and is to be presented this week to the Illinois State Horticultural Society.

The very backward spring and the late frosts caused other injuries. Cherries and apples (fruit) were considerably destroyed. Curiously enough, pears produced a good crop, though subjected several times while in full bloom to from two to six degrees of frost. Somewhat less freezing in the southern part of the State, occurring at the same time, but when the fruit had become well set, entirely destroyed the crop. The case was somewhat similar with peaches. Strawberries with us were badly injured. From this and other causes our small fruits were a practical failure. We have, however, reset about an acre of strawberries for next year's fruiting, and these are now in good condition.

Grapes severely suffered from several diseases, producing fungi infesting the shoots, leaves and fruit. Two of these especially produce what is called "rot" of the berries, and this year made serious havoc with the fruit in June and the first part of July. This difficulty is wholly prevented by inclosing the bunches, soon after they are formed, in paper bags such as are used by grocers; and, though the process is somewhat tedious, the cost does not prevent the use of the bags when grapes are grown for profit if three or more cents per pound can be secured for the crop. Some experiments during the summer showed that the bunches so covered are not later in ripening than those left exposed to the sun and air, neither is their quality affected, while the appearance of the fruit—clean and with full surface bloom—is much better, besides being absolutely free from rotten berries. Considerable attention was also given to these destructive fungi during the summer vacation, but the results are not considered ready for publication. Other studies were made upon diseases of the blackberry, which have been received for publication in the proceedings of the American Society for the Promotion of Agricultural Science and in the American Agricultural Review.

Further investigations were made in the entirely new subject of minute organisms (bacteria) inhabiting the tissues of apparently healthy plants (especially poison ivy, etc.), and an account published in the American Microscopical Journal and to appear in the forthcoming proceedings of the American Association for the Advancement of Science.

I may say in this connection that a considerable portion of my time during the summer and early part of the autumn has been devoted to the study of bacteria in general, and in preparing for the forthcoming Report of the Trustees of the University, a comprehensive paper upon the subject. A large and increasing amount of correspondence upon these and kindred matters seems to show a general interest in the work done. I am pleased to report that the new microscope and its equipments purchased for such work gives entire satisfaction and considerably improves the facilities for investigations of these kinds.

In the experiments on grapes the fact was noted that cutting off the fruit bearing shoots a short distance above the bunches made the berries about one week later in ripening, but increased their size.

A peculiar result came from an experiment in planting large and small seed potatoes (whole). Planting, May 30th. Conditions the same throughout. The large tubers produced on an average six vines, which at first surpassed in vigor of growth the three vines (average) from the small tubers. But during the drouth of August, by the 20th of this month all vines from the large tubers were dead, while the others remained alive, and after the rains of the last of August rapidly grew and finally produced double the yield of the former.

Experiments were made in killing cabbage-"worms," and an emulsion of coal oil was found wholly successful. So far as tried (with soap, concentrated alkali, milk, etc.), the best effect is obtained by forming an emulsion of strong soap solution (soft soap or hard soap dissolved in the least practicable amount of water) by vigorously stirring in an equal volume of kerosene oil and afterward adding water. When ten times the amount of water was added, the insects were all killed, but some spots on the leaves also perished. With care in stirring the mixture, so as to make a perfect emulsion, this or a still more watery preparation may be successfully and readily used. The same may be used for insects on very many other plants and crops. For house plants the addition of twenty times as much water as soap and oil makes an effective emulsion into which the affected parts may be fearlessly plunged.

An experiment in attempting to "seed" corn with spores of smut proved a failure. May 5th, seed corn was covered with smut spores and planted in six rows of fourteen hills each, among similar rows planted with the same seed not smutted. On June 8th, smut spores in water were poured on one row of fourteen hills not previously treated with the smut. September 14th the six rows from smutted seed had smut on twenty stalks. Six

rows from clean seed had twenty-five stalks with smut. One row with smut spores o seedlings had two stalks smutted, while in some other rows from clean seed as many a eight were found. Corn was raised on the same ground two years before but none last year. The life history of this smut fungus is still unknown. The vegetative threads (mycetium) do, however, penetrate the tissues of the plant early in the season and ultimately spread throughout most of the cells of the stalk and ear or leaves, if these latter finally become the place of the spore production.

The ornamental grounds have been kept in good condition. The backwardness of the spring prevented the display of bedding plants as early as usual, but the favorable conditions of the latter part of the season made full recompense for this and the beds and lawn made an excellent showing.

Correspondence is now in progress by which it is believed a suitable man for gardener will be found ready to commence work with the beginning of the new year. I have tried to secure definite information permitting the nomination of a man at the approaching meeting of the Trustees, but am not quite prepared.

All of which is respectfully submitted,

T. J. BURRILL,

Professor of Botany and Horticulture.

Adjourned to 9:30 A. M.

SECOND DAY'S SESSION.

Board met on time; members present as before, with Mr. Bennett added.

Communications from J. W. Pearman and I. N. McConnell were received and placed on file.

It was resolved, that the offers of Messrs. Pearman and McConnell to sell Nebraska land be laid over until next meeting.

Additional appropriations were made from current funds as follows:

Six hundred dollars for buildings and grounds.
One hundred and fifty dollars for Horticultural department.

The resignation of Mr. Scott as member of the Executive Committee was accepted and Mr. Millard was elected to fill the vacancy.

The following report from the Auditing Committee was received and approved:

URBANA, December 13, 1882.

To the President and Board of Trustees of the I. I. University:

The undersigned, your Auditing Committee, would respectfully report that we have examined the reports, vouchers and warrants of the Treasurer and Business Agent of the University and find as follows:

Vouchers number 776 to number 804, both inclusive, and vouchers number 1 to 144 for years 1882-3, and find the same correct and duly paid.

We also find that the report of Treasurer Bunn is correct and recommend approval of the same, and that said reports and vouchers be filed in the office of the Business Agent.

Respectfully submitted,

ALEX. McLEAN,
CHAS. BENNETT,
Auditing Committee.

A communication from Mr. J. McClenahan was received and referred to the Executive Committee and the Regent, for report at the next meeting.

A communication from Dr. Loring, Commissioner of Agriculture, concerning a meeting of representatives of Agricultural Colleges, was received, and on motion of Mr. McLean, the Regent was author-

ized to personally attend such meeting at Washington, D. C., in January, 1883, and he was allowed to expend not to exceed $75 for such purpose.

The request from Literary societies in regard to additional gas jets was referred to the Regent, with power to act.

Adjourned.

R. B. Mason,
Acting President.

E. Snyder,
Secretary.

MARCH MEETING.

The Board met at 4 o'clock P. M., on Tuesday, March 13, 1883, in the University parlor.

Present—Messrs. Kenower, Mason, McLean, Millard and Pearman.

Absent—Governor Hamilton, Messrs. Bennett, Cobb, Landrigan, and Paden.

The records of the last meeting were read and approved.

Recess taken to 8 o'clock P. M.

EVENING SESSION.

The Board met at 8 P. M., present as before.

The election of officers was on motion postponed until to-morrow morning

The Regent read the following report, which was received:

REGENT'S REPORT.

To the Trustees of the Illinois Industrial University:

GENTLEMEN—In the report which I presented to you one year ago, I gave a detailed account of the work of the University in its several departments, indicating a few points in which the service might be improved. The changes which were made at the end of the last collegiate year, gave opportunity for some changes in the outline of instruction, which seemed to me desirable, especially in the courses in Chemistry and in Natural History. The work of the first term in chemistry has taken character adapted to the wants of such students as require that subject as an incident in a broader course of literature and science, without interfering with the substantial foundation desirable for those who expect to make the study of chemistry a specialty.

It is a matter of regret that the finances of the University did not permit the filling of both places made vacant in the Chemical laboratory. In order that the work in that department may be so distributed that it can be properly handled by one professor, some changes must be made in the Chemical and Agricultural courses, as suggested in the revised catalogue which will be transmitted for your approval.

In all respects the work in the department of Chemistry is proving quite satisfactory. The analytical work is characterized by accuracy and precision, and the methods pursued are such as are developing thorough chemists.

Some changes are proposed in the course of Natural History, having in view the same ends which have been attained in the School of Chemistry. It is proposed to extend the course in Zoölogy one term, making three terms for special students of that science, and to give in addition a single term, which shall be complete in itself so far as it may go, for such students as desire that subject in the general courses. Some provision is needed for laboratory instruction in this department. A balance from the appropriation for the Museum has been retained until now, that these needed facilities might be furnished as soon as their character could be intelligently ascertained.

I trust that the practical instruction in this specialty may be brought to the same grade as that which characterizes this institution in its other schools. The collection of shells now on deposit in the Museum can be bought by the University at a fair price, but our present available means will not permit the purchase. It ought to be secured for us, both for the sake of the instruction in zoölogy, and for its relationship to paleontology.

The Museum also needs material in the department of Geology; particularly in specimens of the rocks and fossils of the State of Illinois. I had hoped that assistance in this direction could be secured from the very considerable quantities of duplicates in the hands of the State Geologist. I am satisfied that but little help may be expected from this quarter, and that we must rely in this respect upon our own resources, with such means as the Legislature may be willing to give us. I hope to open correspondence with parties in various sections of the State, which will result in service to the Museum.

In the colleges of the University, other than that of Natural Science, already discussed, the work has been steadily maintained at the creditable standards previously secured, and need not be specially detailed.

The attendance remains fairly good, the whole number of students thus far this year being 378. The last few weeks have brought us an unusual amount of sickness, in the epidemics of mumps, measles, and sore throats, but we have escaped any serious trouble.

Some dissatisfaction exists among the students on account of the action taken concerning the property in the University printing office, and I understand that your attention will be asked in the matter. While I desire that the young men have a full hearing, I trust that the subject may be so settled as shall serve the permanent good order and sound government of the University.

Agreeably to instructions given at your last meeting, a bill has been prepared and presented to the Legislature now in session at Springfield, asking for the assistance needed to carry on the work of the University as now organized, for the next two years. The bill has been acted upon favorably by the committee on appropriations of the House, and waits the farther stages of legislation necessary to its passage. The sums asked are mostly such as the State has regularly appropriated, except an item for the deficit caused by the depreciation in interest. Whether the aggregate be extravagant when compared with the resources of the great State of Illinois, I will not presume to say more than this: that if the University could have the value of one fair ear of corn from each four acres of land on which corn or other grain was raised last year, the total receipts would be more than the year's appropriation asked by this bill.

I present to you Prof. Morrow's report upon the farm. I would ask attention to his recommendation concerning the purchase of the nucleus of the flock of sheep. The lack of sheep has always elicited unfavorable comment, and a beginning may be made at a small outlay. The care and skill shown in the management of the live stock results in constant and regular improvement as valuable in its educational benefits for the agricultural departments, as in the pecuniary advantages which must necessarily follow. A great variety of breeds does not seem advisable, but, on the State agricultural farm, the animals kept should be fair representatives of some choice varieties.

In presenting the report of the Horticultural Department, I ask attention to Prof. Burrill's suggestions concerning the orchard. In the early days of this enterprise a large number of varieties of apples were transplanted into the tract assigned for that purpose. It was understood that much of this planting would be experimental, and that doubtless some sorts would entirely fail. In many instances this has followed. If any part of the experiment is yet incomplete, time should be taken to finish it, but trees which have died or are decided to be worthless should be removed, and the land they occupy turned over to more profitable purposes. At present the Horticultural Department has more land than it can profitably handle, and certain parts of the orchard should be cleared and given to farm crops.

I regret to report that Mr. N. S. Spencer, our very efficient foreman of the carpenter shop, has tendered his resignation, to take effect at the end of the present term. Mr. Spencer is himself one of the best specimens of the products of this institution, and his absence will be a serious loss to us. Authority is asked to fill the vacancy until the end of the present college year.

The detail of Lieut. Wm. T. Wood, of the 18th Infantry, U. S. A., will expire on the 1st of July next. Notice has been received from the General of the Army that Lieut. Charles McClure, of the 18th Infantry, U. S. A., has been detailed to relieve Lieut. Wood, at the time mentioned. There is every reason to expect that the assignment of Lieut. McClure, who comes from Carlinville, in this State, will bring a useful and efficient office to the University. Meanwhile it should be said of Lieut. Wood that he took command of the University Battalion under circumstances of very peculiar difficulty, and that he has acquitted himself throughout with great good judgment and efficiency. I concur in his request for an appropriation of $30 for the purchase of a new flag for the Battalion.

I ask that authority be given for the publication of the Catalogue in an edition consisting of 4,000 copies.

The roof of the Mechanical building leaks badly, and an appropriation of $50 is needed for its repair.

I ask that the balance of State appropriation for the laboratories be assigned to the Physical Laboratory.

I recommend that $150 be assigned from the appropriations for capinets, for provision for laboratory work in that department, and that authority be given to expend the balance for the Museum of Natural History.

Mr. Henry L. Gay offers the University a large and beautiful architectural model, now in the Exposition Building at Chicago, if the University will remove it and give it a place in its premises. A place can be assigned for it in the Engineering Museum. I would suggest that the Regent be authorized to accept the donation, and to remove it, if it be found that the expense will not exceed $100.

Respectfully submitted.

S. H. PEABODY, *Regent.*

The Treasurer then presented his report, which was received and referred to the Auditing Committee:

ILLINOIS INDUSTRIAL UNIVERSITY, *To John W. Bunn, Treasurer, Dr.*

1883.				
Feb. 28	To amount paid salaries	$6,469 95		
	" " Board expense	113 86		
	" " on account Buildings and grounds	212 59		
	" " " Fuel and lights	1,572 20		
	" " " Stationery and printing	186 05		
	" " " Fixtures and furniture	82 18		
	" " " Mechanical Department	448 53		
	" " " Architectural "	588 79		
	" " " Agricultural "	851 80		
	" " " Horticultural "	97 75		
	" " " Chemical "	463 31		
	" " " Military "	26 14		
	" " " Library and apparatus	20 17		
	" " " Incidental expenses	110 19		
				$11,243 51
	State appropriations:			
	To amount paid on account Chemical, Physical and Botanical Laboratories	$34 69		
	" " " Mechanical and Architectural shops	360 00		
	" " " Books and publications	253 23		
	" " " Current expenses	1,503 36		
	" " " Cabinets	5 68		
	" " " Boiler house	67 49		
	" " " Heating and ventilation	33 60		
				2,258 05
	Sundries:			
	To amount paid on account Preparatory Department	$420 00		
	" " " Agricultural Convention, Washington	61 30		
	" " " Cabinets	60		
	" " " Music fees	73 00		
				554 90
	To balance			4,109 45
				$18,165 91

ILLINOIS INDUSTRIAL UNIVERSITY, *To John W. Bunn, Treasurer, Cr.*

1882.				
Dec. 13	By balance			$10,471 44
1883.				
Jan. 1	By interest on $27,000			1,080 00
	By interest on Chicago 7 % bonds			875 00
Feb. 28	By amount rec'd on acc't of Agricultural Department	$674 43		
	" " " Horticultural "	8 25		
	" " " Mechanical "	369 95		
	" " " Architectural "	256 34		
	" " " Chemical "	438 15		
	" " " Buildings and grounds	58 00		
	" " " Tuition in Preparatory Dep't	430 00		
	" " " Students' fees	2,654 00		
	" " " Ill. Cent. R. R. donation	850 35		
				5,739 47
				$18,165 91
	By balance	$4,109 45		

JOHN W. BUNN, *Treasurer.*

URBANA, March 13, 1883.

On motion, Mr. Kenower was added to the Auditing Committee.

The Regent's report was taken up for consideration.

The resignation of Mr. N. S. Spencer, as foreman of the Architectural shop, was accepted, and the employment of a suitable person in his place was referred to the Executive Committee with power to act.

Upon request of Lieut. T. W. Wood, $30 were appropriated for purchase of a national flag for the Cadet Battalion.

The Regent and Faculty were authorized to publish the University catalogue for 1883 in 4,000 copies.

$50 were appropriated for repairs on roof of Mechanical building. $121.02 from State appropriation for laboratories were authorized to be expended for Physical Laboratory.

The model of a monument offered to the University by architect Henry Lord Gay was accepted, and the following resolution adopted:

WHEREAS, Henry Lord Gay, Esq., architect, has offered to the Illinois Industrial University the drawings and the plaster model of his very beautiful and artistic design—a national monument commemorative of Victor Emanuel, first King of Italy, to be erected by the Italian nation at Rome:

Resolved, That the Trustees of the Industrial University cordially and thankfully accept the gift thus generously offered; and that they direct the preparation of a place suitable for its reception and permanent preservation in the Museum of Engineering and Architecture.

The subject of receiving this model and placing it in the Museum was referred to the Executive Committee, with power to act.

The Business Agent submitted his report, which was received and referred to the auditing committee:

Col. R. B. Mason, Vice-President Board of Trustees, Illinois Industrial University:

SIR: I have the honor to transmit herewith the financial statements due from the Business Agent.

Paper A, shows the expenditures from current funds for the six months ending February 28, 1883. Also the receipts which have passed through my hands.

Paper B, gives the condition of the State appropriations February 28, 1883.

Paper C, is a list of vouchers presented for auditing.

Paper D, is a statement of appropriations required from current funds for the next three months. The salaries are on the basis of the past six months.

Respectfully submitted,

S. W. SHATTUCK, *Business Agent.*

URBANA, March 13, 1883.

Current Appropriations.

	Appropriated.	Receipts also appropriat'd	Expended	Balance.
Board expense	$555 62		$416 45	$136 17
Salaries	12,000 00		9,979 17	2,020 83
Stationery and printing	350 00		327 74	22 26
Fuel and lights	2,000 00		1,764 35	235 65
Buildings and grounds	892 63	$237 58	881 15	249 06
Fixtures and furniture	110 00		103 52	7 48
Library and apparatus	50 00		47 84	2 16
Incidental expense	200 00		158 07	41 93
Mechanical Department	202 32	668 31	864 89	5 94
Architectural Department	74 86	1,127 24	1,213 65	45
Agricultural Department	2,417 35	3,724 14	2,730 75	3,410 74
Horticultural Department	209 14	122 37	294 27	37 24
Chemical Department	117 82	573 15	669 55	21 42
Military Department	50 00		37 49	12 51
SUNDRIES.				
Physical laboratory	30 96	15 00	50	45 46
Cabinets	9 45		60	8 85
Students government	25 00			25 00
Examination of schools	25 00			25 00
Agricultural Conv. Washington	75 00		61 30	13 70
Music fees		148 00	148 00	
Tuition preparatory year		885 00	790 00	95 00
Students fees, Un		5,887 00		
Illinois Central freights		850 35		

State Appropriations.

From July 1, 1881.	Appropriated.	Received.	Expended	Balance.
Taxes on lands, ½ per annum	$5,000 00	$4,460 37	$4,460 37	.....
Buildings and grounds	5,000 00	5,000 00	5,000 00	.....
Chem. Phys. and Bot. Labs. per annum	1,600 00	1,600 00	1,478 98	$121 02
Mech. and Arch. shops, per annum	3,000 00	3,000 00	2,559 49	440 51
Books and publications, per annum	3,000 00	3,000 00	2,067 16	932 84
Current expenses, per annum	11,400 00	11,400 00	11,400 00	.....
Library cases	800 00	800 00	800 00	.....
Cabinets	1,000 00	1,000 00	521 48	478 52
Engineering instruments	1,000 00	1,000 00	1,000 00	.....
Furniture	1,000 00	1,000 00	1,000 00	.....
Boiler house	5,000 00	5,000 00	5,000 00	.....
Heating and ventilation	2,500 00	2,500 00	2,500 00	.....
Farm cottage and dairy	1,000 00	1,000 00	1,000 00	.....
Total balance	.....	.....	.....	$1,972 89

The following schedule of current appropriations for the next three months was adopted:

March 14th, 1883	Appropriated.
Board expense	$150 00
Salaries	7,754 96
Buildings and Grounds	500 00
Fuel and Lights	500 00
Stationery and Printing	500 00
Mechanical Dept. Bal	5 94
Architectural Dept. Bal	45
Agricultural Dept. Bal	3,410 74
Horticultural Dept. Bal	37 24
Chemical Dept. Bal	21 42
Military Dept. Bal	55 00
Library and Apparatus	25 00
Incidental expenses	100 00
Sundries—	
Physical Laboratory Bal	45 46
Cabinets	9 45
Examination of Schools	25 00
Students' Government Bal	25 00
Preparatory Year Bal	95 00
	$13,260 66

Adjourned to 8:30 A. M.

SECOND DAY'S SESSION.

The Board met as by adjournment; present as before, with Mr. Paden added.

From the State appropriation for Cabinets $150 were assigned for the Zoölogical Laboratory, the balance of $328.53 to be expended in purchases for the Museum, under direction of a committee, consisting of the Regent, the Business Agent and Professor of Zoölogy and Geology.

Prof. Morrow's report from Agricultural Department was read and received:

UNIVERSITY, March 9, 1883.

Dr. S. H. Peabody, Regent:

SIR—During the last three months farm work has, necessarily, been mainly the care of the stock and dairy, after the completion of corn harvest, which the remarkable nature of the season carried into December. With few exceptions, the farm animals of all classes have done well, and are now in good condition.

I regret to report that most of the corn carefully saved for seed is found to be untrustworthy. We have, I think, 200 bushels which can be relied upon.

The small acreage of wheat sown last autumn now seems in fair condition, as does the rye. The grass seed sown on the rye started well, but has been much injured by the winter.

The plans for the spring include, as chief plowed crops, about 75 acres of corn and 50 of oats—the latter to be seeded with timothy and clover. It seems to me most appropriate for us to make the rearing and feeding of the different classes of live stock the leading feature of our farming in connection with the experimental work.

In this connection I beg to repeat the recommendation that authority be given for the purchase of the foundation of a flock of sheep. Few questions are more frequently asked than those which indicate surprise that we have no sheep. Notwithstanding the former experience with dogs, it is believed they can be kept with safety and some profit, as well as to the advantage of my work in teaching. All things considered, I recommend the choice of one of the "down" breeds, although it would be desirable to make some crosses.

During the two years the farms have been under my direction they have been credited with something over $5,000—this without making charge for experimental work or account of a large quantity of labor and material which might legitimately have been counted as "permanent improvement." Naturally, I have been desirous to have a good balance-sheet shown; and, under all the circumstances, I am well content with the showing made, especially as, at the least, the farms have not suffered loss in condition or appearance.

The possibility of making fair profits having been shown, we may wisely, as it seems to me, pay less attention to this for a year or to, at least, and give such attention and money as may be needed to make the farms attractive in appearance as well as productive. Some repairs and painting of farm buildings is necessary; some new machinery will be needed; further work on the fences, etc., must be done. I hope also to be able to do more experimental work than in the past. As a whole, I think we are fortunate in the men we have on the farm, but if I could have the assistance of a foreman who possessed the rarely combined qualifications of scientific training and practical experience—one who could directly supervise the work of improvements and of experimentation—it would be a great help.

I do not think it will be necessary to go beyond the receipts of the farm, but, to do what is desirable, it will probably be necessary to nearly exhaust the average profits for the present year.

The Annual Agricultural Institute, held last of January, seemed to me as valuable as any we have had. The attendance of students was exceptionally large; that of farmers was not encouraging. I receive many inquiries and requests for information on agricultural topics, with occasional requests for lectures on farm subjects, but it certainly is not apparent that there is a present large demand for the instruction we are able to give here in technical agricultural subjects.

During the quarter, I have given addresses before an institute at Tonica and before the Tilemakers' Association, and found myself unable to meet an appointment for the institute at Princeton.

Respectfully submitted.

G. E. MORROW.

The recommendation to purchase sheep was approved, the amount of such purchase not to exceed $250.

The report of Prof. Burrill, from Horticultural Department, was read and received:

ILLINOIS INDUSTRIAL UNIVERSITY,
CHAMPAIGN, ILL., March 8, 1883.

Dr. S. H. Peabody, Regent, I. I. U.:

I recommend the appointment of Mr. Gustave Klingenspor as gardener for one year (from January 1) at a salary of fifty dollars ($50) per month. Necessity requiring the action Mr. K. was employed by me, and has had charge of the green-house since January 8th. He is, I am convinced, a very faithful and trustworthy man, and as a practical florist is skillful and competent.

Unfortunately we have had very serious trouble with the green-house heating apparatus during the severe weather of the winter. From causes partly known and partly unknown the boiler flues have so choked with tar and soot that it has been impossible to keep them clean, and in consequence the heat from the burning fuel has not been well utilized. Some of the flues have leaked water and we have been compelled twice to have

new ones put in. The cost in labor and material has therefore been considerably more than it would have otherwise been. Besides this, after the most strenuous efforts to save the plants, several kinds have been injured and a few destroyed. No change is now asked for, but during the summer the matter will demand consideration, and in some way improvement must be made.

A case with glass doors is much needed in the office room of the green-house for storing and exhibiting florists' goods, which have heretofore been much injured by the dust and by handling. I refer to baskets and papers for bouquets, designs for crosses, columns, etc. It is thought that twelve dollars will be sufficient for present need.

In the orchard and grounds about the building considerable damage was done to the trees by the ice freezing upon them. In some cases we found limbs had two hundred times their own weight of ice upon them. The numerous broken branches has required considerable pruning, most of which has been done.

For the apple orchard I recommend the cutting away of all trees now unsound to any considerable extent and the trimming to an even height the rows of evergreens. A wire-fence now across the east side will permit the pasturage of cattle, and by cutting the weeds once or twice during the summer the best use and best appearance of the orchard can be secured. The only doubt about the advisability of turning cattle in is whether they may not seriously injure the evergreen trees, but there are so many of the latter that the proper number of cattle may not perceptibly interfere with the trees. I am quite certain that it will not be good policy to undertake to fill up the open spaces with young trees.

All the large size forest trees in the nursery, near the veterinary stable, should be removed this year. Many may be used where needed or sold, but no doubt some will have to be destroyed. The whole place should be cleaned up as fast as possible. If we wanted to use it, as the land is now it is not fit for nursery stock.

I do not find a man to act as working foreman of this part of the horticultural grounds whom I wish to have employed permanently. Probably one capable of filling the place satisfactorily cannot be had for less than $40 to $50 per month

We can hardly expect to "grow" such men as has been suggested and keep them, even at this rate.

Under the circumstances it does not seem to me wise to undertake anything new in this part of our work, i. e. beyond the reach of ordinary laborers with such attention as I can give to it. Neither do I think the latter can be sufficient to do what ought to be done. I dislike the details of peddling things around for sale and of the minutiæ of directions necessary to make really successful any considerable variety of horticultural crops. It is too time-consuming for one thoroughly busy about something else. My whole time is given to proper University work in one sense or another, but it does not seem either justice to myself or to the specialties in my charge that a large amount of it should go as a field laborer or manager. It is to be hoped, however, and we may reasonably expect, that with good crops the ordinary expenses of the department for the season will be covered by the returns. To help in this latter direction I think it best to plant a part of the land north of veterinary stable in onions, though for want of proper winter storage a failure was made last year. In the fall there is very little demand for onions, but in the spring good prices and ready sale is always the case.

T. J. BURRILL,

Professor of Horticulture.

T. Klingenspor was appointed Florist and Gardener, as recommended, at a salary of $50 per month. An appropriation of $12.00 was made for glass case.

The recommendation to remove trees from apple orchard was referred to the committee on buildings and grounds.

On motion of Mr. Kenower the matter of Illini printing office was referred to the Executive Committee and the Regent for report at next meeting.

The following report from the Executive Committee was received and approved:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—At the last meeting of the Trustees a communication from Mr. J. McClenahan, of Knoxville, was referred to a committee consisting of the Executive Committee and the Regent.

A meeting of the committee was held at the office of Col. R. B. Mason in Chicago, on the 13th of January, at which were present Messrs. Mason and Millard, and the Regent. Mr. McClenahan appeared before the committee and presented a detailed statement of his plan for a wider dissemination of agricultural instruction. This plan may be briefly stated thus: That a course of study, adapted to young men and boys working on the farm, should be devised, and that it should be made known to such as might desire to take part therein, by circulars, distributed from a central office.

That communication should be maintained with those pursuing the course of study so provided—by correspondence, and that at stated periods, these persons should be gathered at convenient centers, for brief periods of personal instruction, and for examination. That at the completion of a course of such study extended over several years, diplomas or certificates should be issued to those passing successful examinations, which certificates should set forth the facts.

The scheme, as explained, appears to be quite similar to that carried on by the Chautauqua Association.

Mr. McClenahan stated that he was about to print the paper which he read before the committee, and that copies would be forwarded to the University, but they have not yet been received.

After such considerations as your committee have been able to give this subject, they they have come to this conclusion:

1. There is great doubt in their minds whether this system of instruction would be found adapted to the class of minds which it is designed to reach. Without discussing the merits of the "Chautauqua plan" it is evident that it has been efficient chiefly in its application to persons who had already acquired a considerable impetus from culture derived from other and earlier sources so that it is possible for such to make progress, remote from instructors, and relying chiefly upon their own energies and incentives.

This plan proposes to reach farmers' boys, having had little more than common school instruction, if any, and who, it seems to your committee, would be scarcely likely to progress under such a system of instruction as is proposed.

2. The committee believes that grave questions would arise as to the authority of the Trustees to use the funds now under the control of this University, for such purposes as are set forth in Mr. McClenahan's communication.

At his own estimate the time of one or two persons would be required to make a fair test of the plan, together with some considerable expense for correspondence, printing, and transportation.

Your committee therefore respectfully report that in their judgment this Board is not now in circumstances which will warrant the adoption of a scheme of instruction such as Mr. McClenahan's communication indicates.

Respectfully submitted,
R. B. MASON,
S. M. MILLARD,
J. T. PEARMAN,
S. H. PEABODY.

URBANA, March 13, 1883.

The following officers were then duly elected:

Hon. Emory Cobb, President of the Board.

S. M. Millard, Vice President.

Dr. S. H. Peabody, Regent.

J. W. Bunn, Treasurer.

Prof. T. J. Burrill, Corresponding Secretary.

Prof. E. Snyder, Recording Secretary.

Prof. S. W. Shattuck, Business Agent.

The President, Vice President and Dr. Pearman, were appointed Executive Committee.

The Auditing Committee submitted the following report, which was approved:

ILLINOIS INDUSTRIAL UNIVERSITY,
CHAMPAIGN, ILL., March 14, 1883.

To the President and Members of the Board of Trustees of the Illinois Industrial University:

The undersigned, your committee to audit accounts, vouchers and warrants issued by authority of your body, would beg to report as follows:

We have examined and found correct vouchers number 145 to 295 inclusive (Nov. 29, 1882, to Feb. 28, 1883) and find them correct and duly receipted and canceled.

We have also examined the books and warrants of the Treasurer, J. W. Bunn, and find warrants number 375 to number 758, dated March 15, 1881, to August 31, 1881, and number 1, to 804 dated Sept. 1881, to Aug. 31, 1882, and number 1 to 347 inclusive, dated Sept. 1882, to Feb. 28, 1883, and find the same correct, paid and canceled, and recommend that the Treasurer be credited with same on his account.

We feel impressed to state that the condition of books, accounts and vouchers, warrants and general business of the offices of Business Agent and Treasurer and manner of conducting same merits commendation at our hands, and we therefore place on record our appreciation of their valuable services.

Respectfully submitted.

ALEX McLEAN,
GEO. F. KENOWER, *Auditing Committee.*

A committee, consisting of Messrs. McLean, Millard and Pearman, were appointed to report resolutions of respect on Mr. Gardner's death.

Adjourned.

S. M. MILLARD,
Acting President,

E. SNYDER,
Secretary.

JUNE MEETING—JUNE 5, 1883.

The Board met in the University parlor on Tuesday, June 5, 1883, at 5 P. M.

Present: Messrs. Bennett, Follansbee, Kenower, Millard and Pearman.

Absent: Governor Hamilton, Messrs. Cobb, McLean, Paden and Landrigan.

The oath of office was administered to the newly appointed members, Messrs. Follansbee and Kenower, by Judge Bennett.

A letter from Mr. McLean, respecting his absence, was read and received.

The minutes of last meeting were read and approved.

It was moved and carried to pass to the 4th order of business and take up the Treasurer's report.

This report was read, received and referred to the Auditing Committee.

ILLINOIS INDUSTRIAL UNIVERSITY,

To John W. Bunn, Treasurer, Dr.

1883.				
May 31	To amount paid for	Board expense	$88 40	
	" "	Salaries	7,595 59	
	" "	Buildings and grounds	43 51	
	" "	Fuel and lights	115 65	
	" "	Stationery and printing	86 58	
	" "	Furniture and fixtures	25	
	" "	Mechanical Department	139 87	
	" "	Architectural "	129 43	
	" "	Agricultural "	1,244 81	
	" "	Horticultural "	116 27	
	" "	Chemical "	2 88	
	" "	Military "	30 25	
	" "	Library and apparatus	1 90	
	" "	Incidental expense	25 25	
				$9,620 64
	State appropriations:			
	To amount paid for	books and publications	$169 76	
	" "	Mechanical and Architectural shops	355 16	
	" "	Cabinets	2 26	
	" "	Chemical and Physical Laboratories	31 83	
				559 01
	Sundries:			
	To amount paid for	Preparatory Department	$450 00	
	" "	Gay model	30 40	
	" "	Music	38 00	
				518 40
	Balance			74 50
				$10,772 55

ILLINOIS INDUSTRIAL UNIVERSITY, *To John W. Bunn, Treasurer, Cr.*

1883.					
March	12	To balance			$4,109 45
"	17	To interest on Champaign bonds			570 00
"	31	To amount rec'd on acc't of fees		$1,400 00	
		" " "	Tuition in Preparatory Dep't.	150 00	
		" " "	Music	73 00	
					1,623 00
April	1	To interest on Douglas Co. school bonds		$200 00	
		" $15,000 to Nov. 1.		350 00	
					550 00
May	31	To am't rec'd on acc't of Fees		$745 00	
		" " "	Tuition in Preparatory Departm't.	110 00	
		" " "	Music	38 00	
		" " "	Mechanical Department	193 05	
		" " "	Architectural "	377 01	
		" " "	Agricultural "	2,051 68	
		" " "	Horticultural "	183 74	
		" " "	Chemical "	167 87	
		" " "	Buildings and grounds	53 75	
					3,920 10
					$10,772 55

URBANA, June 5, 1883. JOHN W. BUNN, *Treasurer.*

The Regent submitted the following list of candidates for degrees and certificates, as recommended by the Faculty:

With the degree of B. S. in the College of Engineering—

Edward L. Abbott.....Union Grove.
Alphonso S. Gates.....Hamilton.
William F. Goltra.....Bourbonnais Grove.
George P. Scotchbrook.....Morrison.
William S. Weston.....Champaign.

With the degree of B. S. in the College of Natural Science—

C. Eugene Bogardus.....Champaign.
George C. Hewes.....Farmer City.
John T. Kenower.....Clement.
Arthur W. Palmer.....Springfield.
Fred D. Pierce.....Polo.
Joseph Weis.....Tonica.

With the degree of B. A. in the College of Literature and Science—

Harriet M. Boggs.....Tuscola.
William Sondericker.....Woodstock.

With the degree of B. L. in the College of Literature and Science—

Lida M. Ashby.....Champaign.
Clara B. Fellows.....Millbank, Dakota.
Jessie Gardner.....Champaign.
Nelson A. Gray.....Champaign.
Grace Healey.....Champaign.
William A. Heath.....Champaign.
Lizzie A. Knowlton.....Urbana.
M. Celeste Langley.....Urbana.
C. Florence Lewis.....Farmer City.
Henry L. McCune.....Ipava.
Kate F. Peabody.....Champaign.
Minnie E. Wright.....Champaign.

With the degree of Civil Engineer—

Jerome Sondericker.....Woodstock.

With full certificates—

Charles F. Adams	Natural History	Champaign.
Clarence Brainerd	Civil Engineering	Buda.
William P. Craig	Literature and Science	Champaign.
Dwight C. Haven	Literature and Science	New Lenox.
Joseph D. Huey	Natural History	Clement.
Ralph D. Lewis	Civil Engineering	Champaign.
William D. Moore	Mechanical Engineering	Chatham.
Silas H. Piatt	Chemistry	Monticello.
Mary S. Colvin	Literature and Science	Mt. Palatine.
Ella M. Stewart	Literature and Science	Champaign.

The following have been recommended to the Governor for commissions, for merit in the School of Military Science—

William P. Craig.
Nelson A. Gray.
William F. Goltra.
Dwight C. Haven.
Henry L. McCune.
Fred D. Pierce.

The degrees were so conferred and certificates granted.

Mr. Follansbee was appointed to fill vacancy on Auditing Committee in absence of Mr. McLean.

Adjourned to meet at 8 A. M.

SECOND DAY'S SESSION.

The Board met as by adjournment.

After a discussion of sundry business, the Board adjourned to 3 o'clock P. M. to attend the Battalion Drill, and Commencement Exercises.

AFTERNOCN SESSION.

The Board met on time; present as before.

The Regent read the following report, which was received:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The passing months bring us to another mile-stone in the progress of the University, marked by the events of the annual Commencement. The year that has passed may be counted as one of steady and substantial prosperity.

The number of students has been 289 men and 93 women, a total of 382, nearly as many as the highest recorded number. The order maintained and the quality of the work done has been satisfactory. The Departments of Chemistry and of Zoölogy have been brought to a degree of efficiency which is decidedly in advance of that shown in previous years, and with good promise of farther advancement. The other departments have maintained their well known excellent character.

THE STUDENTS' GOVERNMENT.

The experiment of self-government in matters of minor detail, conducted by the students themselves, is a subject to which the attention of the Trustees has been frequently called. It has ever been a topic of serious criticism, and on the part of those most needing restraint, and hence adverse to any efficient control, one which has met continued opposition. Since an opinion was received from the Attorney General of the State, which in effect greatly restricted the powers of the students' government, the feeling of opposition has steadily grown, even among that class of students who believe in order, and wish to have discipline enforced, because of this impairment of its authority.

Other influences have assisted in strengthening this opposition, especially the dissatisfaction of those who have felt a strong interest in the admission of fraternities into the University. I have steadily withstood all attempts at the sudden and summary overthrow of the government. I have, however, believed that this form of government could not be useful or efficient, unless sustained by the earnest concurrent sentiment of a majority of the students of the University. It is evident that if a majority of those of the students who would vote on the matter at all, should be inimical to the government, that same majority, by gaining possession of the offices by which the government is made operative, could render it inoperative by simple inaction. That has been the condition of the better part of the last two years.

Under the authority of the government itself, an election was lately held by the students upon the question of the continuance of the government after the end of the current collegiate year. The result of the election was 110 votes against the continuance of the government, and 70 for the same—about 120 students did not care to vote. The subject has been carefully considered by the Faculty, and I am asked to lay before you the result of their deliberations in the accompanying preambles and resolutions, in which your concurrence is respectfully asked.

For myself I have to say that I have taken great interest in the progress of this experment in conducting the discipline of American colleges, and I have therefore taken every step which seemed to me proper to maintain the government, so far as its action could be made conformable to the law. Yet I am compelled to say that, during most of the time since I have been Regent, and for at least the last two years of my predecessor's administration, the government has either been purposely inefficient, or, if efficient, has been so conducted as to aggravate rather than eradicate the evils it was intended to control.

APPROPRIATIONS.

You have doubtless watched with interest the progress of the bill making appropriations for the University, through the various steps of legislation in the General Assembly, and you are aware that it still awaits passage on third reading in the House of Representatives. As the success or failure of this bill involves matters of the utmost importance to the financial interests of the University, I respectfully recommend that the consideration of all questions which will depend upon its passage, be postponed until it shall be definitely known what are the intentions of the Legislature towards the University. It is, however, desirable that the Trustees will determine at the earliest moment after the financial condition is fully settled, many items concerning the corps of instruction, repairs, construction, etc.

RESIGNATIONS AND REMOVALS.

You are already informed that the detail of Lieut. W. T. Wood expires on the 1st of July next, and that Lieut. Charles McClure is appointed by the War Department to the vacancy. Lieut. Wood came to the instruction of the University Battalion at a critical period, and undertook its duties amid circumstances of peculiar difficulty. He has shown much tact, good judgment, and fidelity, and I trust that some suitable recognition will be entered upon record concerning his eminent services and success.

Mr. N. S. Spencer, for some time foreman in the carpenter shop, resigned at the end of the last term, in order to go into business for himself in a distant State. He had been a useful instructor and an efficient foreman, and his resignation was much regretted. Mr. George W. Parker, for a considerable time employed under Mr. Spencer, was, with the authority of the Executive Committee, appointed to be foreman until the 15th of June.

Mr. Howard Slawson declines reappointment as 1st Assistant in the Chemical Laboratory.

Mr. Edward S. Morse will not expect reappointment as Assistant in Ancient Languages, as it is understood to be the intention of the Trustees to fill this place with a lady, should satisfactory arrangements be made.

Prof. Snyder's department has required unusual labor during the last year, and his health has been debilitated for that reason and others. He has carried six classes per day during the year, and has had daily before him nearly 200 students. I earnestly recommend that he be provided with the help of a suitable assistant.

I recommend that Mrs. Abbie Wilkinson be appointed teacher of music, for the coming year, upon the usual conditions.

That the appointment of an instructor of elocution be indefinitely postponed.

Other recommendations concerning the corps of instruction I desire to postpone until after the passage of the legislative appropriations.

THE NORTH BARN

is now empty of hay, and the new crop will soon be ready for storage. The barn needs repairs in its foundations, which can not well be delayed. The extent of repair needed can not be positively known until the floor is removed and the sills, some of which are known to be decayed, are disclosed. Authority is asked to expend $250 for these repairs, if so much should be found necessary.

Prof. Morrow's report is herewith appended.

S. H. PEABODY, *Regent.*

The following resolution of the Faculty relative to the college government of students, laid before the Board, was considered and approved:

WHEREAS, The organization for the purpose of maintaining discipline in the University, known as the Students' Government, has been for some time of doubtful efficiency; and,

WHEREAS, At a special election, held on the 29th of May last, the question of the continuity of the government being the only issue voted upon, the result of the ballot was 110 votes against the continuance of the government, to 70 votes for the same, the remainder of the students being apparently indifferent upon the question; and,

WHEREAS, The efficient action of this form of government can be maintained only when the government is sustained by the earnest concurrent sentiment of a majority of the students of the University; therefore,

Resolved by the Faculty of the Illinois Industrial University, That it hereby recalls into its own hands and resumes all authority which it did heretofore commit to the Students' Government, and that the functions of said government shall cease at the end of the current collegiate year.

Resolved, That the present officers of the Students' Government be required to deposit the records of the government with the Regent of the University, to be kept with the records of the University.

Resolved, That the Regent be requested to communicate these resolutions to the Trustees at their next meeting, and that the Trustees be respectfully asked to approve of and concur in the action here taken.

All action of the Board based upon appropriations to be made by the present Legislature was deferred to an adjourned meeting of the Board.

Moved that a committee of three be appointed to draft resolutions in regard to Lieut. W. T. Wood, now relieved from duty as Professor of Military Science. The chair so appointed Messrs. Bennett, Follansbee and Kenower.

Authority was given to continue Mr. G. W. Parker as foreman in the Architectural shops at $60 per month, until the next meeting of the Board.

The Regent's recommendation relating to employing an assistant in the department of Modern Languages was postponed until next meeting.

Mrs. Abbie Wilkinson was appointed teacher of vocal and instrumental music.

The subject of appointing a teacher of elocution was postponed indefinitely.

Repair of barn was ordered as recommended by the Regent, cost not to exceed $250.

Prof. Morrow's recommendation in regard to Griggs farm was referred to the Farm Committee for report at the next meeting.

Leave of absence during vacation was granted to Professors Roos, Baker and Snyder.

The Business Agent read his report, and submitted vouchers, which were received and referred to the Auditing Committee:

S. M. Millard, Esq., Acting Prest. Board of Trustees Ill. Ind. Univ.:

SIR—I have the honor to hand you my report as Business Agent for the three months ending May 31st, '83.

Paper A is a statement of the current appropriations and receipts for three months.

Paper B is a statement of the State appropriations June 1st, '83.

Paper C is a list of vouchers for warrants drawn to June 1st.

Paper D is a statement of the expected income from invested funds in the next three months ending Sept. 1st, '83. Also from balances and Ill. C. freight.

Paper E gives the estimated required appropriations, including Dept. balances, for the three months ending Sept. 1st, upon the present basis.

I hold in my hands unpaid bills, pay-rolls, etc., to the amount of about $1,200—as the balance in the hands of the treasurer was less than $100 on May 31st, '83.

Respectfully submitted,

S. W. SHATTUCK, *Business Agt.*

URBANA, ILL., June 5, 1883.

Current Appropriations.

March 14, 1883.	Appropria'd	Receipts also appropriat'd	Expended.	Balance.
Board expense	$150 00		$88 40	$61 60
Salaries	7,754 96		7,595 59	159 37
Buildings and grounds	500 00	$53 75	43 51	510 24
Fuel and lights	500 00		115 65	384 35
Stationery and printing	500 00		86 58	413 42
Mechanical Department, balance	5 94	193 05	139 87	59 12
Architectural Department, balance	45	377 01	129 43	248 03
Agricultural Department, balance	3,410 74	2,051 68	1,244 81	4,217 61
Horticultural Department, balance	37 24	183 74	116 27	104 71
Chemical Department, balance	21 42	67 87	2 88	186 41
Military	55 00		30 25	24 75
Library and apparatus	25 00		1 90	23 10
Incidental expense	100 00		25 25	74 75
Sundries.				
Physical laboratory, balance	45 46			45 46
Cabinets, balance	9 45			9 45
Examination of schools	25 00			25 00
Students' government	25 00			25 00
Preparatory year,	95 00	260 00	450 00	
Gay model			30 40	
Students' fees		2,145 00		
Music fees		38 00	38 00	

State Appropriations.

From July 1, 1881.	Appropriated.	Received.	Expended	Balance.
Taxes on lands, ½ per annum	$5,000 00	$4,460 37	$4,460 37	
Buildings and grounds, ½ per annum	5,000 00	5,000 00	5,000 00	
Chem., Phys. and Bot. Labs., ½ per annum	1,600 00	1,600 00	1,510 81	$89 19
Mech. and Arch. shops, ½ per annum	3,000 00	3,000 00	2,914 65	85 35
Books and publications, ½ per annum	3,000 00	3,000 00	2,236 92	763 08
Current expenses, ½ per annum	11,400 00	11,400 00	11,400 00	
Library cases	800 00	800 00	800 00	
Cabinets	1,000 00	1,000 00	523 74	476 26
Engineering instruments	1,000 00	1,000 00	1,000 00	
Furniture	1,000 00	1,000 00	1,000 00	
Boiler house	5,000 00	5,000 00	5,000 00	
Heating and ventilation	2,500 00	2,500 00	2,500 00	
Farm, cottage and dairy	1,000 00	1,000 00	1,000 00	
Total balance				$1,413 88

The following list of current appropriations for the three months ending August 31, 1883, was adopted:

Board expense	$150 00
Salaries	7,380 00
Buildings and grounds	50 00
Fuel and lights	1,000 00
Stationery and printing	500 00
Furniture and fixtures	25 00
Mechanical department, balance	59 12
Architectural department, balance	248 03
Agricultural department, balance	4,217 61
Horticultural department, balance	104 71
Chemical department, balance	186 41
Military department, balance	50 00
Library and apparatus	25 00
Incidental expense	100 00
	$14,095 88

Sundries.

Physical laboratory, balance	$45 46
Cabinets	9 45
Examination of schools	25 00
Students' government	25 00
	$104 91
Total	$14,200 79

The Executive Committee reported in regard to the Illini Press property, and submitted the following resolutions, which were adopted:

Resolved, That all property purchased with funds belonging to the I. I. U., or with funds appropriated therefor by the State, for the purpose of assisting the students of said University to publish a students' paper, be held by the Trustees of said University in trust, to be used by the students of said University for said purpose.

And that the Regent of the University be authorized to receive and receipt for, in the name of the Trustees, any property furnished by students or others for said purpose, which property, when received or receipted for as aforesaid, shall be held in trust by the Trustees for said purpose, such paper to be published under such regulations as the Trustees, or the Faculty by authority of Trustees, shall from time to time make.

The Auditing Committee made the following report:

ILLINOIS INDUSTRIAL UNIVERSITY,
CHAMPAIGN, ILL., June 6, 1883.

To Board of Trustees, I. I. U:

Your committee appointed to audit accounts of Business Agent would report that they have examined vouchers from No. 296 to 460 inclusive, and find the same in due form and properly receipted, and recommend that the same be approved.

GEO. F. KENOWER,
CHAS. BENNETT,
G. A. FOLLANSBEE,
Auditing Committee.

Mr. Millard made the following report, which was accepted and adopted:

WHEREAS, This Board has learned of the death of Daniel Gardner, a former colleague of long standing and great usefulness, it is therefore

Ordered, That in respectful tribute the following memorial be spread upon the records of the Board; and that a copy be sent to the family of the deceased.

S. M. MILLARD,
J. T. PEARMAN,
Committee.

IN MEMORIAM.

Daniel Gardner was in early life a resident of the State of Ohio, where he was at one time a member of the State Senate. He came to Champaign, Illinois, in 1856, where he was occupied as a farmer, and afterward as a banker. In 1873, he was appointed a Trustee of the Illinois Industrial University, and served until 1881, as one of the most esteemed and efficient members of this Board. Ever faithful to his trust, his candid practical judgment and sterling integrity lent great weight to his counsels. He was a man of genial character and of noble impulses, conscientious and earnest, always seeking the highest interest of the institution which he represented, and ever showing a courteous consideration for those who were his colleagues or subordinates.

In his death the University has lost a valued friend, an earnest supporter, and a wise and safe counselor.

A communication from Mr. M. Chase, relating to the sale of certain lots, was referred to the Committee on Buildings and Grounds for report at next meeting.

A communication from Mr. W. A. Day, in regard to sale of Nebraska lands, was referred to Executive Committee and Regent.

Mr. Hickox' bill for attorney's fees, amounting to $30, was allowed and the Business Agent directed to pay the same.

The following resolutions were reported by Mr. Bennett, and adopted:

Resolved, That this Board desires to put on record its appreciation of the valuable services of Lieut. Wm. T. Wood, of 18th Inf., U. S. A., during his detail at the University for the three years ending July 1, 1883. His tact, fidelity and efficiency have won the respect and esteem of all under his command, and deserves the fullest commendation.

CHAS. BENNETT,
G. A. FOLLANSBEE,
GEO. F. KENOWER.

The chairman announced the standing committees as follows:

Auditing Committee—Messrs. Bennett, McLean and Kenower.

Farm Committee—Messrs. Pearman, Bennett and Paden.

Committee on Buildings and Grounds—Messrs. McLean, Kenower and Follansbee.

The Vice-President, Messrs. Follansbee and Kenower were appointed a committee to inspect the system of bookkeeping used in the accounts of this University, and report.

Adjourned, to meet at Chicago, (84 LaSalle street,) at a time to be fixed by the President of the Board.

S. M. MILLARD,
Acting President.

E. SNYDER,
Recording Secretary.

BOARD MEETING—JUNE 22, 1883.

The Board of Trustees met at 84 LaSalle street, in Chicago, Ill., at 10 o'clock A. M., as per adjournment.

Present—Messrs. Millard, Bennett, Pearman, Follansbee and McLean.

Absent—Messrs. Mason, Kenower, Paden and Cobb.

Mr. McLean appointed Secretary *pro tempore*.

On motion, the reading of the minutes of last meeting was postponed till next meeting.

Mr. G. A. Follansbee gave Mr. McLean the oath, re-appointing him a Trustee of the Illinois Industrial University.

The Regent read his report, which was received.

To the Trustees of the Illinois Industrial University:

GENTLEMEN—I have to present at this adjourned meeting the following subjects for your attention, necessarily passed by at the regular meeting:

THE FACULTY.

I recommend the re-appointment of Prof. Wm. McMurtrie to the Chair of Chemistry; of Prof. B. C. Jillson to the Chair of Geology and Zoölogy; of Assistant Prof. C. H. Peabody, in the Department of Mechanics. The appointment of Instructor Jerome Sondericker to be Assistant Professor of Engineering and Mathematics; of Instructor Chas. W. Rolfe, to be Assistant Professor of Natural History, and of Geo. W. Parker, to be foreman of the Carpenter Shop. Of Arthur W. Palmer to be First Assistant in the Chemical Laboratory, and of F. W. Eberlein to be Second Assistant in the same.

I would ask that authority be given for the appointment of a lady to be Instructor of Ancient Languages, in place of E. S. Morse, resigned, and for the appointment of an assistant in Modern Languages.

I ask attention to the matter of salaries, and that a schedule be arranged such as the necessities of the case seem to require.

BUILDINGS AND GROUNDS.

A change is needed in the method of sewering the Main and Chemical buildings. At present the drainage is conducted to an open pore southeast of the Main buildings, whence the overflow is carried by two small tile-drains across land not owned by the University, opening in the highway on Green street east of Prof. Burrill's house.

The small drains are now choked up, and need relaying, even if the drainage is kept as it is now arranged.

A better plan would be to open a sufficient sewer from a point mid-way between the Main and Chemical buildings, to run directly north and empty into the creek in the Arboretum, the whole line being on the property of the University.

This sewer should be connected with the buildings by short changes of present lines, and with the drainage system of the wet lands beyond. Surveys and estimates are made, which I present herewith.

The water-closet attached to the ladies' dressing room has become a serious trouble at times infecting the whole west wing. The closets should be taken out, and reconstructed; with proper arrangements, and our ample supply of water, there is no reason why they may not be kept clean, and the present annoyance be obviated.

The fence on the north side of Green street needs to be replaced.

Some work is needed in the Engineering Museum, to prepare for the reception of the Gay model, and for other engineering models.

The estimate will be as follows:

For sewer and connection	$530 00
For ladies' closet	260 00
For fence	600 00
For Museum of Engineering	175 00
	$1,565 00

LABORATORIES.

I present the estimates of Prof. McMurtrie for material for his department, and recommend that it be allowed. That $500 of it be charged against the State appropriation, and the remainder against the current account of the department.

I recommend that $300 be assigned to the Physical Laboratory for the purchase of optical apparatus.

Referring to that part of Prof. Burrill's report which concerns his room, I suggest that an appropriation be made for the construction of tables specially adapted for microscopic work, and that the farther fitting of the room be deferred until more detailed plans can be had at the next meeting of the Board.

LIBRARY.

An appropriation of $150 is asked for binding books. The number of volumes in the Library is now upwards of fourteen thousand. For these we have no catalogue except the card catalogues which are kept in the Library room, and which can be consulted by only two or three persons at once. A simple list of the titles of the books will occupy a volume of about 120 pages, octavo. It would greatly add to the usefulness of the library, and I would recommend its publication. The catalogue should be sold at a price which will barely cover cost; an edition of 1,500 copies would be ample until the growth of the library would require a reissue.

THE BLACKSMITH'S SHOP.

An appropriation was asked for $2,500 for building and equipping a blacksmith's shop to be an addition to the machine shop. The plan proposed is to add a building one story high, about 32x36 ft., to extend westwardly from the southwest tower. The walls to be of brick upon a stone foundation. The roof of wood with iron ties and metallic covering. The room to contain eight double forges, blast to be furnished by a blower driven by the shop engine, and the smoke to be taken by hoods and conveyed by iron pipes to an iron chimney. For the last, one of the iron chimneys now in the main building and out of use since the boilers were removed to the boiler-house, may be utilized. The cost of the building was estimated by Prof. Ricker at $1,250. The remainder of the appropriation will be needed for equipping the buildings with forges, anvils, flues, etc. It is part of the design to put a cupola in the end, for smelting iron for foundry practice. I suggest that the construction of this building be referred to a proper committee.

The selection of machines to be placed in the Machine and Carpenter's shop, will require a little time and care. I hope, however, that we may secure at least three small engine-lathes, one shaper and one planer for the Machine shop, and a series of small wood-lathes for the Carpenter's shop, with the necessary shafting, belting, etc. It would be well to have a variety of manufacturers represented, in the choice of these tools.

I present Prof. Ricker's report, and recommend that his request for tools be considered in the expenditure of the State appropriation; and that the drawing instrument be allowed.

I present a report from Prof. Burrill concerning the boiler and chimney in the Greenhouse. The latter needs rebuilding, owing to decay of mortar; the boiler now in use has given much trouble to the Mechanical department ever since I have known it, and I believe it to be radically defective. Provision should be made for a better system of heating before another winter.

Prof. Baker asks for an appropriation of $25 to provide for resetting a spiral for surveying classes in the college grounds. The arrangement is of very great service, and I concur in his request.

Respectfully submitted,

S. H. PEABODY, *Regent.*

Committee on State Appropriations made the following report of the appropriations for the next two years:

For the payment of taxes in the States of Nebraska and Minnesota, $2,500 per annum.

For current repairs and improvements on buildings and grounds, $3,000 per annum.

For current expenses of Chemical, Physical and Botanical laboratories, $1,500 per annum.

For current expenses of educational work, $1,500 per annum.

For University library, $1,500 per annum.

For the University museums, $1,000 per annum.

For current expenses of instruction, $14,000 per annum.

or erecting an addition to the Machine shop for blacksmithing and foundry work $2, 00.

For the purchase of additional machines and tools, $2,000.

Communication from Trustee Paden excusing his absence on account of illness, was read and filed.

The Regent, Trustees McLean, Bennett and Follansbee were appointed a committee on University Lands, to whom all papers on the subject were referred for report.

Adjourned until 2:30 P. M.

Board met on time.

The Regent's report was taken up for consideration.

On motion of Mr. Follansbee, the following resolution was adopted:

Resolved, That the following named persons be reappointed as Professors of the Illinois Industrial University, at the annual salary herein named for the ensuing year and until further action be had by this Board, such appointments to be in accordance with section 3, article 5, of the by-laws of this Board:

T. J. Burrill, Prof. of Hort	$2,000 per annum
S. W. Shattuck, Prof. of Math	" " "
E. Snyder, Prof. of M. Lang	" " "
J. C. Pickard, Prof. of E. Lang. and Lit	" " "
N. C. Ricker, Prof. of Arch	" " "
J. D. Crawford, Prof. of Hist. and Anc. Lang	" " "
G. E. Morrow, Prof. of Agri	" " "
F. W. Prentice, Prof. of Vet. Sci	$1,800 " "
Peter Roos, Prof. of Ind. Art	1,400 " "
I. O. Baker, Prof. of Civ. Eng.	1,800 " "
Wm. McMurtrie, Prof. of Chem	2,000 " "
B. C. Jillson, Prof. of Geol. and Zool	2,000 " "
C. H. Peabody, Asst. Prof. of M. E	1,200 " "
E. A. Kimball, Foreman of M. Shop	1,500 " "
Geo. W. Parker, Foreman of Carp't. Shop	65 per month.
J. Sondericker, Asst. Prof. of Eng. and Math	$90 per month for 10 months
C. W. Rolfe, Asst. Prof. of Nat. History	100 " " " " "
A. W. Palmer, First Asst. in Chem. Lab	50 " " " " "
Mrs. A. Wilkinson, Teacher of Music	$50 per term and fees

On motion of Trustee Bennett, it was ordered that the Regent be authorized to engage the services of a second assistant in Chemical Laboratory at a salary of $15 per month for time actually employed.

On motion of Trustee Follansbee, A. B. Baker was re-appointed as janitor at a salary of $60 per month for ensuing year.

On motion of Trustee Bennett, the Regent and Executive Committee were authorized to engage the services of an instructor in Modern Languages and an instructor in Ancient Languages at a salary not to exceed $600 for the former, and $1,000 for the latter.

The following resolution, on motion of A. McLean, was read and adopted:

By Trustee Follansbee—

Resolved, That in making the appointments of Professors for the ensuing year and until further action be had by this Board, it is not the intention of the Board to make the tenure of such professors less permanent than heretofore, but that said action is had simply to comply with section 3 of article 5 of its by-laws.

On motion of Trustee Bennett, the Regent, Trustee Pearman and the Business Agent were appointed a committee to procure repairs as follows:

1. A sewer from the Main and Chemical buildings, northwardly to the creek in the Arboretum, in accordance with plans exhibited, to cost not to exceed $530.

2. The repair of the water-closets in the west wing of Main building, to cost not to exceed $300.

3. To rebuild fence on north side of Green st., $600.

On motion of Trustee McLean, the matters relative to Museum, Gay model, etc., were referred to committee on Buildings and Grounds, cost not to exceed $175.

On motion of Trustee Follansbee, $600 was appropriated for Chemical Laboratory.

On motion, $300 was appropriated for Physical Laboratory.

On motion of Trustee Pearman, the following appropriations were made:

$150 for tables for Botanical Laboratory.
$150 for book binding.
$250 for printing Library catalogues.
$18 for a section liner for School of Architecture.
$265 for the heating of Conservatory.
$25 for surveying spiral for School of C. E.

On motion of Trustee McLean, the Executive Committee and Regent were authorized to build and equip the Blacksmith shop according to plans and specifications, not to exceed the legislative appropriation.

On motion of Trustee Follansbee, the Executive Committee and Regent were authorized to expend so much of the money appropriated for tools and machines as they may deem best.

On motion, the Executive Committee was authorized to negotiate with Prof. Shattuck relative to salary as Business Agent, with power to act, and report to the Board at next meeting.

On motion by Trustee Bennett, it was

Resolved, That the next regular quarterly meeting of this board be held on the 4th day of Sept., 1883, at 3 o'clock P. M., at the University building, at Urbana, Illinois.

S. M. Millard,
Acting President.

A. McLean,
Acting Secretary.

BOARD MEETING—SEPTEMBER 4, 1883.

The Board met in the University parlor, on Tuesday, September 4, 1883, at 4 P. M.

Present—Messrs. Bennett, McLean, Millard, Paden and Pearman.

Absent—Gov. Hamilton, Messrs. Landrigan, Cobb and Follansbee.

The records of the meetings of June 5 and June 22, 1883, were read and adopted.

The Regent's report was then read and received:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The most important topic which will come before you at this meeting is the policy to be adopted in regard to the lands owned by the University in Nebraska and Minnesota. Those in Nebraska, in particular, have come to such a condition as demands that some line of procedure should be determined at once. If nothing more is done, it seems desirable that the lands be made to earn their cost, so that the Trustees may no longer be compelled to go to the Legislature for the payment of taxes. The subject will be brought before you in the report of a committee, which will be laid before you in the course of the present meeting.

I desire to call attention to a proposition now before you, offering to the University the lots south of the Mechanical Hall, between the track of the Urbana Horse Railway and the Arboretum. The price seems reasonable, and the lots should not be allowed to pass into other hands, as that might cause much inconvenience to the University, at some later time if not now. A diagram has been prepared which will illustrate the matter.

The work ordered by you at the last meeting in various departments is in progress, and will be ready for report at the next meeting.

I present the quarterly report of the Agricultural Department. The farms present constant and decided improvement, in fact and in appearance. The repairs at the north barn, ordered at the June meeting, have been made, and have required but a small part of the appropriation made for the purpose. I suggest that authority be given to use so much of the remainder of that appropriation as may be needful for painting the same barn. I further suggest that the appearance of the farm-house on the South farm would be much improved by painting and such minor repairs as that would require, and that $150 be appropriated for that purpose.

In the University building the gentlemen's hat and coat room is a source of considerable annoyance. It is most conveniently situated, but has scanty room, and is too much a place of resort and lounging. I think it would be well to increase the number of boxes, etc., in the room, and then to employ there an attendant who shall receive all articles left on deposit and give checks therefor. The increased box-room will cost about $25. An attendant can probably be hired for say $5 per week.

I ask your attention to the list of appropriations presented by the Business Agent for the next six months.

I recommend that $1,000 from the State appropriation for books and publications be assigned for the purchase of books for the Library, and that authority to expend the same be given to the usual committee.

Attention is asked to a communication from Prof. Burrill, herewith reported.

Mr. Sturtevant, of Boston, Mass., has presented to the University, for use in the new blacksmith shop, one of his patent blowers, with the requisite supply of blast gates, —a very valuable donation.

S. H. PEABODY, *Regent.*

The following communication from Mr. Emory Cobb was read and received:

RAGATZ, SWITZERLAND, August 8, 1883.

To the Board of Trustees of the Illinois Industrial University:

GENTLEMEN—I regret to inform you that on account of sickness in my family, and other reasons, I shall probably not return home until the summer or autumn of 1884. Under these circumstances, I deem it your due and my duty to tender you my resignation as chairman of your Board, and hope that you will elect my successor at the coming September meeting. In this connection, please accept my heartfelt thanks for honors you have conferred upon me in the past, and for the uniform courtesy you have ever extended to me as your chairman. Hoping that your deliberations will always be pleasant, and for the best interests of the University,

I am, yours, very respectfully,

EMORY COBB.

Prof. Morrow's report from Agricultural Department was read, accepted, and referred to the Farm Committee.

Prof. Burrill's report from Horticultural Department was read, and referred to the Committee on Buildings and Grounds, and the Regent.

Adjourned to 7:30 P. M.

EVENING SESSION.

The Board met as by adjournment; present, as before.

Treasurer Bunn presented his report, which was read, and, on motion of Mr. McLean, it was received and filed.

ILLINOIS INDUSTRIAL UNIVERSITY.

To JOHN W. BUNN, TREASURER, *Cr.*

1883.				
June 5	By balance			$74 50
"	By interest on Menard Co. bonds			700 00
" 15	" " Mogan Co. bonds			1,750 50
July 2	" " Champaign Co. bonds			4,200 00
"	" " Pike Co. bonds			2,100 00
"	" " Sangamon Co. bonds			880 00
"	" " Chicago Water bonds			875 00
"	" " Kankakee School bonds			300 00
"	By am't rec'd from State for taxes on lands in Minnesota and Nebraska		$2,469 06	
"	" " " " " repairs and improvements		3,000 00	
"	" " " " " expenses of laboratories		1,500 00	
"	" " " " " educational work		1,500 00	
"	" " " " " library and museum		1,500 00	
"	" " " " " laboratories		1,000 00	
"	" " " " " expenses of instruction		14,000 00	
"	" " " " " addition to machine shop		2,500 00	
"	" " " " " machines and tools		2,000 00	
				29,469 06
Aug. 31	By am't rec'd on acc't Architectural department		$768 90	
"	" " " " Agricultural department		1,241 03	
"	" " " " Horticultural department		411 30	
"	" " " " Chemical department		4 22	
"	" " " " Mechanical department		155 53	
"	" " " " Stationery and printing		140 00	
"	" " " " Buildings and grounds		55 83	
"	" " " " I. C. R. R. freight donations		261 60	
				3,038 41
				$43,386 97

URBANA, Sept. 4, 1883.

JOHN W. BUNN, *Treasurer.*

ILLINOIS INDUSTRIAL UNIVERSITY,

To JOHN W. BUNN, TREASURER, *Dr.*

1883.						
Aug.	31	For Board expense		$77 03	
"		For am't paid for salaries		7,449 78	
"		" " " on acc't buildings and grounds		100 12	
"		" " " " fuel and lights		658 35	
"		" " " " stationery and printing		569 25	
"		" " " " fixtures and furniture		3 45	
"		" " " " Mechanical department		253 94	
"		" " " " Architectural department		519 16	
"		" " " " Agricultural department		2,369 63	
"		" " " " Horticultural department		521 06	
"		" " " " Chemical department		172 22	
"		" " " " Military department		23 25	
"		" " " " Library and apparatus		17 42	
"		" " " " incidental expense		59 55	
					$12,794 21
		Sundries—			
Aug.	31	For am't paid on acc't attorney's fees		$30 00	
"		" " " " cabinets		60	
"		" " " " Physical laboratory		3 50	
"		" " " " examinations of schools		5 80	
"		" " " " Gay model		25 55	
"		" " " " drafting instruments		18 00	
"		" " " " civil engineering		7 49	
					90 94
		State Appropriations—			
Aug.	31	For am't paid on acc't books and publications		$928 87	
"		" " " " Chem. Phys. and Bot. laboratories		89 19	
"		" " " " cabinet		529 52	
"		" " " " Mechanical and Architectural shops		185 55	
"		" " " " buildings and grounds		1,737 36	
"		" " " " blacksmith shop		997 56	
"		" " " " machines and tools		573 35	
"		" " " " taxes on lands in Minnesota and Nebraska		2,469 05	
					7,510 46
		Balance			22,991 36
					$43,386 97

URBANA, Sept. 4, 1883. JOHN W. BUNN, *Treasurer.*

Business Agent Shattuck presented and read his report, which was received and referred to Regent and Trustees Bennett and Paden, with request to make report on same to the Board on the 5th instant:

Current Appropriations.

	Appropriated.	Receipts also appropriat'd	Expended	Balance.
Board expense	$150 00		$77 03	$72 97
Salaries	7,455 00		7,449 78	5 22
Buildings and grounds	50 00	$55 83	100 12	5 71
Fuel and lights	1,000 00		658 35	341 65
Stationery and printing	500 00	140 00	569 25	70 75
Fixtures and furniture	25 00		3 45	21 55
Mechanical Department, balance	59 12	155 53	253 94	—38 35
Architectural " "	248 03	768 90	519 16	497 77
Agricultural " "	4,217 61	1,241 03	2,369 63	3,089 01
Horticultural " "	104 71	411 30	521 06	5 05
Chemical " "	186 41	4 22	172 22	18 41
Military "	50 00		23 25	26 75
Library and apparatus	25 00		17 42	7 08
Incidental expense	100 00		59 55	40 45
Sundries—				
Physical Laboratory, balance	45 46		3 50	41 96
Cabinets, balance	9 45		60	8 85
Examination of schools	25 00		5 80	19 20
Students' government	25 00			25 00
Drafting instrument	18 00		18 00	
Spiral civil engineering	25 00		7 49	17 51
Attorney fees	30 00		30 00	
Ill. Cent. freight		261 60		

State Appropriations.

July 1, 1883.	Appropriated.	Received.	Expended	Balance.
Taxes on lands, ½ per annum	$5,000 00	$2,469 06	$2,469 06	.....
Buildings and grounds, ½ per annum	6,000 00	3,000 00	1,737 36	$1,262 64
Chem., Phys. and Bot. Lab's, ½ per annum	3,000 00	1,500 00	.....	1,500 00
Mech'l and Arch'l shops, " "	3,000 00	1,500 00	100 00	1,400 00
Books and publications, " "	3,000 00	1,500 00	165 79	1,334 21
Cabinets, " "	2,000 00	1,000 00	53 26	946 74
Current expenses, " "	28,000 00	14,000 00	.....	14,000 00
Blacksmith shop	2,500 00	2,500 00	997 56	1,502 44
Machines and tools	2,000 00	2,000 00	573 35	1,426 65
	$54,500 00	$29,469 06	$6,096 38	$23,372 68

Adjourned to 8 o'clock A. M.

SECOND DAY'S SESSION.

Board met pursuant to adjournment; present as before.

Trustees Paden and Bennett were appointed on Committee on Buildings and Grounds, in place of Follansbee and Kenower, absent.

Trustee Pearman made the following report from Executive Committee:

ILLINOIS INDUSTRIAL UNIVERSITY.

CHAMPAIGN, ILL, Sept. 5, 1883.

The Executive Committee report the appointment of Miss Emma M. Hall, of Cazenovia, N. Y., to be Instructor in Ancient Languages, at a salary of $100 per month for ten months. Miss Hall graduated at Michigan University in 1874, and took her Master's degree at the same place the year following. She brings abundant testimony to her character, ability and success as a teacher.

They also report the appointment of Miss Mary E. Darrow, a graduate of Allegheny College, to be Assistant in Modern Languages—at $60 per month for ten months.

Respectfully,

S. M. MILLARD,
J. T. PEARMAN,
Executive Committee.

The report was received and the appointments approved.

Trustee McLean made the following report from Committee on Buildings and Grounds:

URBANA, Sept. 5, 1883.

To the President and Trustees of the I. I. U.:

Your committee to whom was referred the matter of purchase of lots from Mr. Chase, would respectfully report that the lots are situated immediately south and adjoining the lot on which our shops and Drill-hall are situated and adjoining the Arboretum, thereby dividing the grounds of the University, which is not desirable. A plat of the same we herewith attach.

In view of these facts we would recommend that your Board purchase said lots described as lots 1, 2, 5, 6, and one lot unnumbered on said plat, from said Chase, with such moneys as are not otherwise appropriated. The same can be purchased for the sum of four hundred and fifty dollars.

Respectfully submitted,

A. McLEAN,
R. N. PADEN.

The report was accepted and adopted; the Executive Committee were instructed to make purchase as recommended.

The Chairman of the Committee on Buildings and Grounds made the following report:

URBANA, Sept. 5, 1883.

To the President and Board of Trustees of Illinois Industrial University:

Your Committee on Buildings and Grounds would report, in the matter of additional room for Prof. Burrill, as set forth in his report to this Board, that while it would be convenient, and supply a needed improvement, yet, in view of the financial condition of the University, the needed improvements could not at present be made. We would therefore recommend no further action be taken in the matter for the present.

We would also report that work in fitting up the Gay model, and repair of cases in the Mechanical Museum room, is being completed according to instructions of the Board.

Respectfully,

ALEX. McLEAN,
R. N. PADEN,
CHAS. BENNETT.

The chairman of the Auditing Committee submitted the following report, which was received and approved:

To the Board of Trustees of the Illinois Industrial University:

We, the undersigned, Auditing Committee, respectfully report that we have examined vouchers of Business Agent, Nos. 461 to 663, inclusive, except No. 465, (Hickox), and find the same in due form and properly receipted, and recommend that they be approved by the Board.

CHAS. BENNETT,
ALEX. McLEAN,
Auditing Committee.

The chairman of the Farm Committee reported progress in the matter of tiling the Griggs farm, and asked further time for final report. Granted.

A bill of $123.75, for traveling expenses, from Dr. Peabody, was audited and allowed.

The Committee on Nebraska Lands reported progress of work, and asked further time for final report, which was granted.

The Regent's recommendation in regard to painting the north barn, and repairing and painting the house on stock farm, was referred to the Executive Committee, with power to act.

One thousand dollars were assigned from the State appropriation for library, for the purchase of books and periodicals, to be expended under the direction of a committee consisting of the Regent, the Librarian and the Business Agent.

The donation of a blower for machine shops, from Mr. Sturtevant, was received, and the Regent was requested to express to Mr. Sturtevant the thanks of this Board.

The recommendation of repairs of cloak room, contained in Regent's report, was referred to Executive Committee, with power to act.

The following appropriations were made for the six months ending February 29, 1884:

Current Appropriations for Six Months.

September 4, 1883.	Amount.
Board expense	$300 00
Salaries	17,900 00
Buildings and grounds	50 00
Fuel and lights	1,500 00
Stationery and printing	300 00
Architectural Department	497 77
Agricultural Department	500 00
Chemical Department	18 41
Military Department	50 00
Library and apparatus	50 00
Incidental expense	200 00
	$21,456 18
SUNDRIES.	
Physical Laboratory, balance	$41 96
Cabinets	8 85
Examination of schools	19 20
Spiral, Civ. Eng	17 51
	$87 52
Total	$21,543 70

On motion, the resignation of Mr. Cobb as President of the Board was accepted.

On motion of Mr. Bennett, the Board proceeded to elect its President for the unexpired term.

Trustee S. M. Millard was elected President of the Board for the unexpired term by unanimous vote.

Trustee Bennett was appointed member of the Executive Committee, vice Mr. Cobb.

The compensation of Prof. S. W. Shattuck as Business Agent was fixed at $300 for the year ending September 1, 1884.

On motion of Trustee Bennett, it was voted that a standing committee of three be appointed as Finance Committee.

The chairman so appointed Trustees Bennett, Follansbee and Paden.

Adjourned.

S. M. MILLARD,
President.

E. SNYDER,
Recording Secretary.

BOARD MEETING—DECEMBER 11, 1883.

The Board met at 3 P. M. in the University parlor.

Present—Governor Hamilton, Trustees Bennett, Earle, McLean, Millard, Paden, Pearman and Postel.

Absent—Trustees Follansbee, Cobb and Landrigan.

Trustees Earle and Postel presented their credentials, were duly sworn, and took their seats as members of the Board.

The record of the meeting of September 4, 1883, was read and approved.

The Regent then presented his report, which was read and received:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The opening of the present year's work presents items for regret and for congratulation. All concerned would be glad to see present at the University a larger number of students. The number for the term is 239 men; 64 women; 303 total. This is less by about 13 per cent. than last year, though it does not differ materially from the number two years ago at the same time. The reduction in numbers is found to be chiefly in the preparatory class. There is a larger proportion of technical students as compared with those in literary courses, than in any previous year. The new students are well prepared, so that there have been fewer conditioned and fewer rejected than usual, without any weakening in the strength of the examinations. It is believed that the general standards of scholarship in the University are gradually improving.

The Faculty has never been more united, competent or efficient than at present. In the various departments, with scarcely one exception, good work is done; and in some the results are exceptionally commendable. The changes which have occurred have all resulted favorably in maintaining or increasing efficiency.

Lieut. Charles McClure, the military instructor, has taken up with zeal and discretion the work left by Lieut. Wood. Miss Hall is gathering the scattered strands of the work which, in her department, has been in a measure neglected for the past three years. The lady you appointed as assistant to Prof. Snyder was found to have made an engagement elsewhere, and, with the sanction of the Executive Committee, Miss Mary E. Darrow, a graduate of Allegheny College, in Meadville, Pa., was appointed to the vacancy. Prof. Snyder speaks with high praise of her work.

On the very day of the opening of the fall term, Prof. Cecil H. Peabody, Assistant in Mechanical Engineering, left to accept an appointment, very complimentary to himself, at the Massachusetts Institute of Technology, in Boston. His abrupt departure, leaving five classes unprovided with instruction, caused me much anxiety. With the approval of the Executive Committee, an effort was made to secure aid from the corps of engineers in the United States Navy, which resulted in the detail of Assistant Engineer Arthur T. Woods, a graduate of the Naval Academy at Annapolis, employed at the time of his detail in the Bureau of Naval Construction at the Department in Washington. The detail, as made by Secretary Chandler, was a compliment to the State of Illinois and to its University. The gentleman appointed reported at once, and brings skill and efficiency to his work. I have engaged that he shall receive from the University $400 per annum in lieu of subsistence and quarters, for which I ask your approval.

ELOCUTION.

Much anxiety is expressed among the students for instruction in elocution. The subject presents many difficulties. The work cannot be satisfactorily provided for unless some arrangement can be made for a resident instructor who shall be here during the year. It does not appear that the funds of the University will warrant the employment of

a full professor for this subject. Such instruction as has been given in past years has been paid for by special fees from the students, but the amount thus obtained has been inadequate to secure a good teacher. I would not advise that the special fee should be remitted, but would suggest that five dollars per term should continue to be collected from each student of this specialty, and that the Trustees add from the general fund enough to guarantee a payment of, say $80 a month, for ten months. The experiment can be tried for the remainder of the current year, and future action can be shaped in accordance with its measure of success.

THE GYMNASIUM.

Some of the apparatus in the Gymnasium is getting much out of order, and the safety of those who exercise there requires its repair. Nothing has been done for this interest in several years, and I would recommend that an appropriation of $150 be made for repairs and additions to its material. A portion of our students are much interested in, and I think are benefited by, practice in the Gymnasium.

WORK UPON THE FARM.

Without attempting to propose any plan for detailed and compulsory labor on the part of agricultural students, which I am convinced would be impolitic and unprofitable, I have yet a suggestion to make which I hope may be productive of good. I am constantly asked by letter or in person, if we can give work to students who desire to support themselves by labor. We desire to assist such persons so far as may be practicable, but outside of the shops and the grounds, the care of buildings, etc., we really have little to offer. The south farm is too far away to permit of the use of labor by the hour, nor is the work needed there such as can be efficiently done in that way. There seems to be more opportunity for using such labor with reasonable profit and success at the north barn—in feeding and milking cattle and work in the dairy house, the orchard and the small-fruit plantations. To do this, however, the boys who work should be housed conveniently near their work. Might it not assist in this respect if the south dormitory, near the veterinary house, were moved into the vicinity of the north barn, and the statement could be made to those who ask for work that they could be provided with work at suitable rates, in the ways I have indicated? I would request the reference of this topic to a committee, who should report thereon. If found feasible, the change could be made at no serious cost during another summer in season for the opening of the next year.

IMPROVEMENTS.

Most of the improvements which you ordered in June are now completed.

The blacksmith's shop has been erected. It is 31 by 36 feet on the ground and 14 feet high. The roof has a lantern 10 by 30 feet, with glazed ventilating sash. The shop contains sixteen fires, with anvils and tools to correspond. The freshman class are now at work there, and the anvil chorus rings there with as much music and more attractiveness than that scored by the famous composer. A cupola furnace for melting iron is yet to be placed in this shop; it is now under construction as part of the class work of the students. The amount expended in building and equipping this shop thus far is $2,256.42; appropriation, $2,500.00.

The machines and tools obtained from the appropriation for this purpose include include three engine lathes, a hand lathe and a shaper for the machine shop; a series of hand and other tools for the carpenter's shop, and a supply of belting much needed for both.

The amount expended is $1,559.77. The appropriation is $2,000.00.

The balance of the appropriation is needed for a series of chucks, and for a supply of small wood-lathes with their necessary driving shafts and pullies.

The sewer has been finished with connections to all needed points, including the farm drainage. It has cost $526.59. Appropriation, $550.00.

The changes in the ladies wardrobe have been made at a cost of $265.05. Appropriation, $300.00.

The Museum of Engineering and Architecture in the upper story of the west wing, begins to show its capacities as a source of interest and instruction.

All the available cases have been re-arranged and are enough to make one range along the west side of the room.

In them are placed the collection of models received from the patent office, with much that is illustrative of our own students' work.

The material now gathered is much more effective than when it was scattered among the various class-rooms.

The Victor Emanuel Memorial Model, presented by its designer, Mr. H. L. Gay, is in place, under a cloistered dome designed by Prof. Ricker to receive it. It was necessarily somewhat broken in removal, but has been thoroughly repaired and restored, by the skill of Mr. Lorado Taft, who has kindly given attention to this work, assisted by Mr. Baker. The model is one of the most attractive art gems in the possession of the University. The expenditure thus far has been $313.05.

I ask that a farther appropriation of $50 be made for carrying forward the work in this museum.

The new boiler for the greenhouse is in place, and is found to be doing its work with entire satisfaction. The cost has been $260.89. Appropriation, $265.00.

I invite your attention to reports, herewith presented from Prof. McMurtrie on the Chemical Laboratory: Prof. Burrill on the grounds and Prof. Morrow on the farm.

Prof. Burrill asks an appropriation from fund for chemical, physical and botanical laboratories of $60 for additional microscopic apparatus, which should be granted.

In accordance with authority given by the Executive Committee, the lots No. —— have been purchased of Mortimer C. Chase, on a deed and abstract approved by Hon. J. C. Cunningham, at $450.

The gents' cloakroom has been remodeled at a cost of $30.62, and custodians put in at a cost of $20 per month.

Respectfully submitted,

S. H. PEABODY.

The Regent presented an invitation to the members of the Board to attend a reception at his house during the evening. On motion the invitation was accepted.

Adjourned to meet at the Regent's residence, at 10 P. M.

EVENING MEETING.

Board met as by adjournment. Present as before.

The committee appointed to examine and report on Nebraska lands belonging to the University, made the following report:

To the Trustees of the Illinois Industrial University:

In the performance of the duty assigned to it, your committee first made an examination of the lands in question. They were visited and carefully inspected by the Regent, and afterwards by Mr. Bennett. A series of diagrams or plats has been prepared and is presented herewith, showing the situation of the lands, their proximity to the city of Beatrice and other growing towns, their nearness to railroads and railway stations, with all streams, highways, school houses, etc., and all occupied and improved farms in the vicinity.

Gage county lies in the southern border of Nebraska, about sixty miles west of the Missouri river, and directly south of Lincoln, the capital of the State. Its county seat is Beatrice, a rapidly growing town of not less than 4,000 inhabitants, and the third town in the State. The county is drained by the Big Blue river and its affluents, the river being, next to the Platte, the largest in the State. It furnishes several valuable water powers, that at Beatrice being the best and most developed. Four different lines of the Burlington and Missouri Railroad in Nebraska, and one branch of the Union Pacific Railway, cross Gage county.

The University lands lie in the eastern part of the county, from 14 to 20 miles distant from Beatrice. The distances from any of the lands to some one of the stations of Holmesville, Blue Springs, Wymore, Liberty, Filley, Crab Orchard and Adams, are between four and ten miles, and in most cases a settler would find an outlet for whatever he might have to market within five or six miles. The lands are well adapted for either tillage or grazing, being high rolling prairie, intersected by living streams. On about one section the soil is comparatively thin, with occasional stones. On all the rest the soil is deep and rich, a fertile loam carrying only sand enough to make it quick, warm and easily worked. The University lands are surrounded almost solidly with cultivated farms, on which were found heavy crops of corn and oats, wheat, flax, etc., with occasional patches of cultivated timber. The country is bare of native lumber except in the immediate vicinity of the Big Blue and its larger affluents. The laws of Nebraska require all cattle to be fenced or tied or herded, so that growing crops need no fence protection. The University lands were found to be parcelled out between herdsmen, chiefly non-residents from Missouri or Kansas. At least six herds of cattle and three of sheep, amounting in all to 10,000 or 12,000 head, were found feeding upon our lands. When the sections were not prairie, the neighbors were cutting and stacking very considerable crops of hay.

Your committee made frequent inquiries of the neighboring settlers concerning the lands and the condition of the land market in the vicinity. They found the settlers kindly disposed toward the University, desirous in many instances of securing portions of the

land for themselves, at prices which they deemed reasonable, and equal to what they would have to pay to private speculators. If the lands should not be sold they could be leased with little difficulty for tillage, pasturage, or for the hay. Careful inquiries were made as to the values of the lands, as indicated by sales actually made and recorded within the past season. Guided by this evidence, your committee believes that some of the lands will bring as much as fifteen dollars per acre, and that all would find buyers within a short time at prices which would average not less than twelve and a half dollars per acre on the whole estate.

Your committee believes that prices of lands in Gage county are now relatively high, and that the rates are liable to be lower in the near future: while there can be no doubt that at a time not far distant there will be little difference in the prices of these lands and those in the older States in the Mississippi Valley.

Every advance in the price of these lands which can be secured to the University assures to it a larger endowment capital, and therefore a larger annual income for the institution for a long period of years. The policy to be adopted should be such as will increase the permanent endowment by the largest possible amount.

If the Trustees decide to keep the lands, a system of leasing should be devised, by which all expenses may be paid, and a moderate income secured, while the title to the lands, and to the increase of values which will surely come, remains in the University.

If the Trustees decide to sell the lands soon, there should be no time lost in offering them for sale.

Your committee believes that the largest returns may be secured to the University by methods of sale which shall deal directly with actual settlers, requiring cash payments enough to secure the sale, and giving long time for deferred payments at reasonable rates of interest. It deprecates any policy of selling in bulk unless at prices very similar to those which can be secured for small lots. The buyer in bulk expects to sell again, and to secure a profitable margin for himself.

This is not unreasonable, but your committee believes that this profit may in the main be secured directly to the University itself, and if so, that it ought to be so secured.

Respectfully submitted,

CHAS. BENNETT,
S. H. PEABODY,
Committee.

The report was received, and, after considerable discussion, further action was deferred until to-morrow morning.

On motion, the Board adjourned until to-morrow morning at 8 o'clock.

SECOND DAY'S SESSION.

The Board met, pursuant to adjournment. (Same number present as yesterday.)

The report of Prof. Morrow, from Department of Agriculture, was received and referred to Farm Committee.

COLLEGE OF AGRICULTURE, Dec. 10, 1883.

Dr. S. H. Peabody, Regent:

SIR—I have the honor to submit the following report: The balance to the credit of the farms, Dec. 1, 1883, was $2,359.64. On Sept. 1, last, $2,089.07 was transferred from the farm credit to the general fund, reducing the balance, at that date, to $500.

The total receipts for the year ending Dec. 1 were	$7,502 55
The total expenditures for the year were	6,592 10
Leaving a balance of	$910 45
The salable property of the farms is valued at	$12,366 00
Compared with one year since, this is a decrease of	53 00
The farm teams (nine horses) are valued at	1,275 00
Showing a decrease of	125 00
The implements and machinery are valued at	1,900 00
Showing an increase of	58 75

This shows a decrease of $124.25 in all farm property. Deducting this from balance from year's operations, gives $786.20 as the net gain of the work of the year.

Among the farm expenditures were a little over $500 for tile drainage, and somewhat over $625 for special repairs and improvements on the barns, erection of windmills, etc., which are outside of ordinary repairs. Including these amounts, and we have a total of, in round numbers, $1,920 to the credit of the work of the year.

Chief items of sales were:	
Cattle	$3,318
Hogs	1,052
Horses	335
Poultry	82
Total from live stock	$4,787
Butter and milk	$700
Corn	$210
Rye	246
Wheat	108
Oats	66
Total from grain	$630
Hay and straw	$633
Rents	486
Among chief items of expenditures were:	
Labor and superintendence	$3,337
Live stock	1,411
Drainage	504
Machinery	230

In above summaries fractions of dollars have been omitted.

The property on hand may be thus summarized:

Cattle—	
Short-horns, 51 (5 unregistered)	$5,440
Jerseys, 11 (3 unregistered)	1,050
Grade cows and heifers, 11, at $45	495
Grade yearling heifers, 18, at $30	540
Grade heifer calves, 10, at $15	150
Grade steers, 26	930
Grade steer calves, 8	110
Total cattle, 135	$8,705
Hogs—	
Breeding stock, 12	$173
Pigs, 49, at $7	343
Pigs, 35, at $2	70
Total hogs, 96	$586
Sheep—	
10 choice Shropshire and Southdowns	$300
Chickens	60
Grain	$670 00
Hay, straw, ensilage, corn fodder	1,285 00
Miscellaneous	210 00
Teams, as above	1,275 00
Implements and machinery	1,900 00

The season was especially unfavorable for the corn crop. We have not had so small a yield or of so inferior quality since I have known the farm. Fortunately we have been able to secure a limited quantity of good seed. Other farm crops were good.

Almost without exception the live stock is in good condition; as a lot it is of higher quality than we have had at any former time.

The work of draining the "Griggs farm" is approaching completion. The exact cost cannot yet be stated, but will not be far, for the drainage and fencing, from $600. The farm has been leased for another year to F. G. Jaques at $460 for 120 acres and one-half the hay on the remaining 40 acres.

At the recent fat-stock show in Chicago, we exhibited a few fat steers, which attracted favorable notice, and were sold to good advantage. They were not entered for competition for prizes, and through an oversight, not our own, were omitted from the official catalogue.

Since the last meeting of the Board we have obtained six finely bred Shropshire lambs, and by exchange on very favorable terms, with Hon. J. R. Scott, four well bred Southdown lambs, as the foundation for a flock of sheep.

Taken as a whole, I count the farms in better condition than at any former time since under my direction.

Concerning my work in the University, I can only say I have been much gratified at the interest shown by few students in my classes. The only discouragement is in the smallness of the numbers. With apparent growing belief in the possibility of a Professor of Agriculture giving instruction, as evidenced by many more calls than can be responded to for public addresses, newspaper articles and answers to very many private letters of inquiry on agricultural topics, the number of agricultural students does not increase.

Wide circulation has been given to announcement of the facilities offered to students of agriculture during the Winter term, and it is hoped a considerable number may avail themselves of these facilities. Arrangements are in progress for the usual Farmers' Institute, or Agricultural Lecture Course, which it is purposed to hold from Jan. 31 to Feb. 3, 1884.

I take pleasure in acknowledging the hearty interest and frequent assistance given by yourself and the chairman of the farm committee of the Board of Trustees.

Respectfully submitted,

G. E. MORROW, *Professor of Agriculture.*

On motion, Mr. Eastman of Iowa was requested to appear before the Board, in order to submit proposition for lease or purchase of Nebraska lands. This offer was as follows:

1st. To lease for 5 or 10 years, on same plan as adopted by the State of Iowa.

2d. The sum of $8 per acre, 25 per cent. cash; $\frac{1}{4}$ in 2 years, $\frac{1}{4}$ in three years and $\frac{1}{4}$ in 4 years with 7 per cent. interest payable annually.

On motion of Mr. Bennett, the propositions were rejected.

Prof. Burrill submitted the following report from Horticultural Department, which was read and received:

ABSTRACT OF REPORT FROM HORTICULTURAL DEPARTMENT.

The work of the season has been made as complete as the funds permitted, and besides the remunerative labor, considerable attention was paid to cleaning up the old nursery site and to the trees in the forest-tree plantation and orchard. From the latter many dead and dying trees have been removed, though numerous unsound ones still remain.

The fruit this year from the experimental orchard gives further evidence of the fact that so far as quality is concerned we have a number of varieties, not known in the ordinary orchards of the country, which are of high rank. But there is yet no evidence that there is any one kind among them all superior or even equal to the best kinds of commonly planted, when productiveness, season of maturing, hardiness, etc., are considered.

It appears pretty clear also that the use of evergreen shelter belts distributed through the orchard is not of marked value. At least no difference can be made out as to the bad effects of cold on account of the shelter thus offered.

A considerable number of observations upon the so-called annular rings of growth have been made on the trees of the orchard and forest-tree plantation. In some cases these rings are less in number than the known number of years attained by the trees, in fewer instances there are more rings than the number of years elapsed. An attempt is also made to compare the growth with the meteorological characteristics of the seasons since the trees were planted.

The grapes (fruit) were nearly all killed by the frost in May, and the products from the small fruits generally were reduced at least one-half by the same cause. These plantations are now apparently in good order for fruitfulness another year.

All added information upon the blight of pear and apple trees confirms the previously reported conclusions that bacteria are the direct and active agents in this disease. Attention has been paid to the question as to whether any want of or excess of nutritive substances in the soil has any connection with the development of the malady. As far as proof can be attained within the time, the possibility of saving trees, by cutting away infected parts, has been demonstrated. Examinations need to be made at least once every two weeks during the growing season, and especially careful in July and August. A photograph recently made, presented herewith, shows a pear tree thus saved after many of the larger limbs had been infected one year from inoculations. Another tree of the same kind, similarly diseased, but not pruned, is now entirely dead. When examinations are made, the chief attention is given to the appearance of the bark where blight first appears. It will not answer to depend upon the discoloration of the leaves, for this takes place later, often by weeks or months. Care is especially taken to really remove *all* the parts infected and to prevent contamination by the pruning implements. Wounds are covered by linseed-oil paint.

Mr. Gustave Klingenspor entered upon the duties of gardener last January, having been employed for one year. I recommend that he be reemployed at same salary, with the understanding that his term of service may terminate at any time after three months' notice has been given by either party. The green house and its contents are now in better condition than for some time past—due mostly to Mr. Klingenspor's work and suggestions. A new water heater was purchased of J. D. Carmody, of Evansville, Ind. This gives excellent satisfaction as far as tried.

The flower beds and lawn have been kept in good order during the summer, and have elicited many words of commendation. Mr. A. B. Baker has looked after the mowing and the work on the drives and walks, as well as helped in the care and treatment of the grounds in many ways. The wooden walk along the drive reaching the front gate is much decayed, and will soon need extensive repair or replacement. I strongly recommend its removal and the construction of a substitute down the west side of the bordering row of trees. It is essential to have one walk of solid material to provide a passageway when the cinder walks are soft by thawing in springtime, and brick or tile made for the purpose is, I am confident, the best material to be had within moderate cost.

Many of the trees planted on the lawn were originally intended for temporary effect, and among these were the soft maples along the front drive. It seems to me these should now be removed, together with some others of like character. A part taken at a time will avoid too marked a change.

The lots recently purchased from Mr. Chase have been included, by moving the fence, with the arboretum. Should trees be planted upon those lots, so that the area will correspond with the rest of the inclosure?

Very respectfully submitted,

T. J. BURRILL.

Mr. Bennett offered the following resolutions, which were unanimously adopted:

Resolved, That the lands in Gage Co., Nebraska, belonging to the Illinois Industrial University be offered for sale upon the conditions following:

1. The lands may all be sold in one body at a price of not less than twelve dollars and fifty cents ($12.50) per acre.

2. The lands may be sold in lots not less than regularly subdivided quarter-sections, at such prices as may be severally assigned to each, which prices shall average for the whole body of lands not less than thirteen dollars ($13.00) per acre.

3. In either case the buyer shall pay in cash at the time of sale not less than one-fourth of the price of the land; and shall pay interest annually upon the deferred payments at not less than eight per cent. per annum.

Resolved, That a committee be appointed to arrange prices for the lands, by quarter sections, with the methods of offering the lands for sale, and the details of contracts and deeds, in accordance with the conditions above specified.

Resolved, That the lands which may remain unsold on the first day of April, 1884, be leased for the season of 1884 on the best terms which can be obtained.

Mr. Donnelly, of Chicago, presented a matter of advertising in his book entitled From the Lakes to the Gulf, which was taken under advisement.

On motion, the Board adjourned until 2 P. M.

AFTERNOON SESSION.

Board met as by adjournment.

Present—Trustees Millard, Bennett, Pearman, Earle, McLean and Postel.

The President appointed the following members to fill vacancies on committees: Trustee Postel on Auditing Committee, Trustee Earle on committee on Buildings and Grounds, vice Kenower, resigned.

The Treasurer presented his report, which was received and referred to the Auditing Committee.

ILLINOIS INDUSTRIAL UNIVERSITY.

To JOHN W. BUNN, TREASURER, *Cr.*

1883.				
Sept.	4	By balance		$22,991 36
	29	By am't rec'd on acc't students' fees	$2,625 00	
		" " " tuition Prep. department	375 00	
				3,000 00
Oct.	1	By interest on Douglas Co. school bonds		200 00
Nov.	30	By am't on acc't Mechanical department	$424 00	
		" " Architectural department	69 24	
		" " Agricultural department	3,785 51	
		" " Horticultural department	150 04	
		" " Chemical department	112 00	
		" " buildings and grounds	91 99	
		" " fuel and lights	108 50	
		" " music fees	48 00	
		" " tuition Preparatory department	72 50	
		" " students' fees	77 75	
				5,569 53
				$31,760 89

ILLINOIS INDUSTRIAL UNIVERSITY,

To JOHN W. BUNN, TREASURER, *Dr.*

1883				
Feb. 30	For Board expense		$239 52	
	" amount paid salaries		1,898 01	
	" " " on acc't buildings and grounds		35 31	
	" " " " fuel and lights		712 19	
	" " " " stationery and printing		259 00	
	" " " " Preparatory Department		450 00	
	" " " " Mechanical Department		383 87	
	" " " " Agricultural Department		2,125 87	
	" " " " Architectural Department		814 57	
	" " " " Horticultural Department		157 96	
	" " " " Chemical Department		143 03	
	" " " " Military Department		20 75	
	" " " " Library and apparatus		4 25	
	" " " " incidental expenses		110 04	
				$7,354 37
	STATE APPROPRIATIONS:			
	For amount paid on acc't buildings and grounds		$1,098 05	
	" " " " Laboratories		1,083 05	
	" " " " Mech. and Arch. shops		346 87	
	" " " " books and publications		138 52	
	" " " " cabinets		21 06	
	" " " " current expenses		6,499 80	
	" " " " blacksmith shop instructions		1,258 86	
	" " " " machines and tools		986 42	
				11,432 63
	SUNDRY EXPENSES:			
	For amount paid on acc't Physical Laboratory		$1 80	
	" " " " civil engineering		15 07	
	" " " " music fees		48 00	
	" " " " premium on roads		300 60	
	" " " " Chase lots		450 00	
	" " " " Art Departments		48 36	
	" " " " hat room		30 63	
				893 86
	Balance			12,080 03
				$31,760 89

URBANA, Dec. 11, 1883. JOHN W. BUNN, *Treasurer.*

The matter of unexpended balances in appropriation for buildings and grounds was referred to the committee on same in order that they be properly expended.

The report of the Business Agent was received and placed on file.

Current Appropriations.

Sept. 4th, 1883.	Appropriated.	Receipts also appro'at'd	Expended	Balance.
Board expense	$423 75		$239 52	$184 23
State			6,499 80	
Salaries	17,990 00		1,898 01	9,592 19
Buildings and grounds	50 00	$91 99	35 31	106 68
Fuel and lights	1,500 00	108 50	712 19	896 31
Stationery and printing	300 00		259 00	41 00
Architectural department	497 77	699 24	814 57	382 44
Mechanical "		424 00	383 87	40 13
Agricultural "	500 00	3,785 51	2,125 87	2,159 64
Horticultural "		150 04	157 96	
Chemical "	18 41	112 00	143 03	
Military "	50 00		20 75	29 25
Library and apparatus	50 00		4 25	45 75
Incidental expense	200 00		110 04	89 96
Preparatory department		417 50	450 00	
Sundries—Physical Lab. bal.	41 96		1 80	40 16
Cabinets bal.	8 85			8 85
Examination of schools	19 20			19 20
Civil Engineering	17 51		15 07	2 44
Student fees		2,702 75		
Music fees		48 00	48 00	
Premium on bonds	300 00		300 00	
Chase lots	450 00		450 00	
Art department	50 00		48 36	1 64
Hat room			30 63	

State Appropriations.

July 1st, 1883.		Appropriated.	Received.	Expended	Balance.
Taxes on lands	½ per annum	$5,000 00	$2,469 06	$2,469 06	
Buildings and grounds	" "	6,000 00	3,000 00	2,835 41	$164 59
Laboratories	" "	3,000 00	1,500 00	1,083 05	416 95
Mechanical and Arch. shops	" "	3,000 00	1,500 00	446 87	1,053 13
Books and publications	" "	3,000 00	1,500 00	304 31	1,195 69
Cabinets	" "	2,000 00	1,000 00	75 32	924 68
Current Exp. of Inst.	" "	28,000 00	14,000 00	6,499 80	7,500 20
Blacksmith shop		2,500 00	2,500 00	2,256 42	243 58
Machines and tools		2,000 00	2,000 00	1,559 77	440 23
		$54,500 00	$29,469 06	$17,530 01	$11,939 05

The following report from committee on Buildings and Grounds was received, and action thereon deferred until next regular meeting:

URBANA, ILL., Dec. 12, 1883.

To President and Board of Trustees of I. I. U.:

The undersigned, your committee on Buildings and Grounds, would respectfully report that we have examined the requests set forth in report of Prof. Burrill, and recommend as follows:

1st. That a good and substantial brick tiling sidewalk be laid in front of main building on line set forth in plan herewith attached, and in lieu of the present plank walk, to be constructed under orders of the Executive Committee.

2d. We would approve of recommendations made by Prof. Burrill relative to cutting out such maple trees as he may deem best in order to preserve the general appearance of the grounds in harmony with all the surroundings.

3d. We would recommend that trees be planted on line of lots bordering on line of railroad, recently purchased by your Board, in same manner as the grounds adjoining.

Respectfully submitted.

ALEXANDER McLEAN,
PARKER EARLE,
Committee.

The Farm Committee made the following report, which was received and approved:

URBANA, ILL., Dec. 12, 1883.

To the Board of Trustees of I. I. U.:

GENTLEMEN—The committee to whom was referred the matter of drainage and leasing that portion of University lands known as the Griggs Farm, beg leave to report that they have had put in 800 rods of tile-drain, at a cost of $500, and have leased said farm for the sum of $450, and one-half of hay on 40 acres of meadow.

J. T. PEARMAN,
R. N. PADEN,
CHAS. BENNETT,
Farm Committee.

The Executive Committee submitted the following report, which was received and placed on file:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The Executive Committee report as follows:

That on the 11th of September, upon consideration of the items referred to it by the Board at the meeting of Sept. 5th, with power to act upon them, authority was given to the Regent to expend money therefor, not to exceed the sums specified, as follows:

For purchase of the "Chase lots"	$450
For painting the North Barn	150
For repairs in gentlemen's wardrobe	25
For an attendant in same, per month	20
For seven curtains in upper Drawing Room	14

That on the 13th of September, the recommendation of the Regent that Miss Mary E. Darrow be appointed assistant in Modern Languages at a salary of $600 for ten months, was approved, and the appointment was ordered at the salary named.

Also authority was given to Dr. S. H. Peabody, Regent, to sign on behalf of the University the requisite petitions to secure a street railway in front of the property of this University on Wright street and Green street. The condition of the petition to be such that the track of such railway shall be so constructed as not to disfigure the street, and shall be kept in good repair with road bed full and level so as to form no obstruction to carriage crossing at any point opposite the University land; and no depot building shall be erected opposite the University Buildings without the consent of the Board of Trustees. The construction and conditions above to be embodied in the ordinance and a guarantee that sufficient cars shall daily run on the proposed line as to accommodate the needs of the travel to and from the University.

The expenses in the Gentlemen's Coat Room have been found to be $30.63.

The authorization for street railway has been entered in only so far as the line on Wright street is concerned.

S. M. MILLARD,
J. T. PEARMAN,
CHAS. BENNETT.

On motion of Mr. McLean, the Regent, Trustees Millard, Bennett and Pearman were appointed a committee, to report at this session of the Board a plan whereby the Nebraska lands can be offered for sale as per terms of the resolutions heretofore adopted.

On motion, the action of the Executive Committee in engaging the services of Miss Mary E. Darrow, was approved; also the obtaining the detail of Mr. Arthur T. Woods of the U. S. Navy as Instructor in Mechanical Engineering, and the allowance of $400 per annum, in lieu of subsistence and quarters, was approved and appropriated.

On motion, the Regent and Executive Committee were empowered to employ a teacher of elocution, if they deem it necessary.

On motion, not to exceed $150 was appropriated for the gymnasium, as asked by the Regent.

A bill of Trustee Bennett, for expenses incurred in inspecting Nebraska lands, amounting to $54.20, was audited and allowed.

The question of employing student labor was referred to the Farm Committee for report at the next meeting.

The following appropriations were made:

$50 for Mechanical Museum.
$60 for Microscopic Apparatus.
$75 for Physical Laboratory.
$5.62 for repairs in Cloak Room.

The report of the Executive Committee on the purchase of lots, as authorized at the last meeting, for the sum of $150, was approved; also their report relating to repairs of cloak room.

On motion, the account of Dr. Peabody, amounting to $76.30, of expenses to Washington, in order to obtain the detail of a U. S. Navy officer as Instructor in Mechanical Engineering, was audited and allowed.

The following resolution was offered by Trustee Earle, and adopted:

WHEREAS, There has recently been a most disastrous fire at Carbondale, destroying the fine building of the Southern Normal University, whereby that institution has been crippled for usefulness for years to come; and,

WHEREAS, This University building is regarded as insufficiently protected, and it is a matter of utmost importance that it be properly protected against such a great disaster; therefore,

Resolved, That the Executive Committee be requested to devise, if practicable, some additional measures for the security of this building against fire.

On motion, the Board adjourned, to meet at the Doan House at 7:30 P. M.

EVENING SESSION.

The Board met on time. Present as before.

The following report from the Auditing Committee was received and ordered filed:

URBANA, ILL., Dec. 12, 1883.

To the President and Board of Trustees of Illinois Industrial University:

The undersigned, Auditing Committee, would beg leave to report that we have examined all vouchers and accounts, numbered 634 to 667 inclusive, and number 1 to 200 inclusive, and find same correct.

We also report having examined the account of Treasurer J. W. Bunn, and find the same correct.

We also find that voucher No. 465, heretofore reported as not being receipted, is now returned properly signed and receipted and recommend its allowance.

ALEX. McLEAN,
PHILIP H. POSTEL,
Committee.

On motion of Trustee McLean, it was ordered that the Regent be authorized to reëngage the services of Mr. Klingenspor as florist, at a salary of $50 per month.

On motion of Trustee Bennett, the matter of advertising in the book, "From the Lakes to the Gulf," was referred to the Regent and the President of the Board, with power to act.

On motion of Trustee Earle, the petition of G. W. Parker, foreman of Architectural shop, for increase of salary, was referred to Regent and Executive Committee, with power to act.

On motion of Trustee Pearman, it was ordered that the offer of $30 for telegraph poles, wires and fixtures be accepted, and the proceeds covered into the treasury.

Mr. Millard, from the committee appointed to arrange for the sale of the Nebraska lands, reported as follows:

Resolved, That a committee of two be appointed to appraise and fix minimum prices on the lands in Gage Co., Nebraska, belonging to the Illinois Industrial University, for the purpose of offering them for sale. That the lands so valued be offered in amounts not less than regularly sub-divided quarter sections. That the buyer shall pay in cash, at the time of purchase, not less than one-fourth of the price of his purchase, and the balance in deferred payments at such times and in such amounts as the committee shall deem most advantageous to make sale of such lands. That such deferred payments shall draw interest at eight (8) per cent. per annum, payable annually, with penalties in interest on such interest payments after due of not less than eight (8) per cent. per annum until paid, and that the purchaser shall pay all taxes which may be levied upon the lands so sold, after the day of the sale.

Resolved, That when prices are fixed, as aforesaid, said committee shall adopt such measures for advertising said lands and receiving bids thereon at or above the prices fixed as shall seem best adapted to make speedy sales. That said committee may employ such aid as they may deem necessary to make such sales, incurring no unnecessary expense, and paying no commissions on such sales to agents or other persons unless with the approval of the Executive Committee. That in the event of competition for any one or more quarter sections by bids at or in excess of the minimum price of any such lands, said committee shall submit such bids, together with the terms and securities offered, to the Executive Committee, which shall make the award.

Resolved, That the sales herein provided for shall be made either by contract, with covenants for quit-claim deeds to purchasers upon completion of all deferred payments with interest thereon, or such deferred payments may be secured by mortgage or trust deeds. But said committee shall adopt, in making such sales, a method of security which shall furnish the safest and simplest security to the University, using such forms and instruments as shall be deemed best for perfecting such securities.

Resolved, That all of said lands shall be offered in bulk to any purchaser at a price not less than twelve dollars and fifty cents ($12.50) per acre. And at any time after portions of said lands have been sold, the remaining lands not sold may be sold in bulk at the minimum price of twelve dollars and fifty cents. In case such sale in bulk is made, not less than one-fourth of the price shall be paid in cash, and the deferred payments shall be for such time and on such terms, interest to be paid at not less than eight per cent. per annum, as the Executive Committee shall determine, subject to the further approval of the Board of Trustees.

Resolved, That when any lands belonging to the Illinois Industrial University, and situated in Gage Co., Nebraska, shall be sold, the President of the Board of Trustees of said University shall be, and he is hereby, authorized to execute a quit-claim deed for such land or lands in the name of said Board of Trustees; and the Secretary of said Board shall attest the same and shall affix the seal of the University thereto. Such deed and the execution thereof shall conform to the laws of the State of Nebraska, provided that the deed and the execution thereof shall not conflict with the laws of the State of Illinois and the resolutions of this Board, as to the authority of the Board.

S. M. MILLARD,
CHARLES BENNETT,
J. T. PEARMAN,
S. H. PEABODY,
Committee.

On motion of McLean, the resolutions were adopted unanimously, and Charles Bennett and the Regent were appointed a committee, with authority to carry the resolutions into effect.

On motion, the Board adjourned until next regular meeting, subject, however, to the call of the President.

BOARD MEETING—MARCH 11, 1884.

The Board met at the University parlor at 3 P. M.

Present—Trustees Earle, McLean, Follansbee, Millard and Pearman.

Absent—Governor Hamilton, Trustees Landrigan, Bennett, Cobb and Paden.

Letters regretting their inability to be present at this meeting were received from Messrs. Bennett and Paden.

The records of last meeting were read and approved.

The following officers of the Board were unanimously reelected:

President of the Board, Mr. S. M. Millard.

Recording Secretary, Professor E. Snyder.

Corresponding Secretary, Professor T. J. Burrill.

The Regent presented his quarterly report, which was read and received:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—A partly formed custom may expect at this, the annual meeting of your Board, an analysis of the work done in the University in its various departments, viewed from an educational standpoint; a review of the workmen and of their labors. In the earlier and formative days, when changes were constant and everything was new, such a review had a very appropriate place. At present it seems enough to note that in most of the chairs of the University the incumbents are men of long residence, of known and acknowledged ability, of unremitting industry and of unwavering fidelity. To name a part would be invidious, to name all superfluous. I may be permitted, therefore, to pass without specific mention most of the departments as well established and bearing good results already known to you, while I may, without impropriety, speak briefly of some in which changes have occurred recently.

The Chemical department has come upon a solid and substantial foundation, entirely satisfactory. The value of the work done here is especially commended by our graduates who go on in further study in schools of medicine or pharmacy, or into actual chemical practice. Important analyses have been made during the year by the professor and his assistants, particularly in a field now attracting much attention, the chemistry of the hog, and of hog-products, and the results have attracted much attention at home and abroad. Other fresh investigations will be reported by the students themselves, and embodied in their theses. The Chemical laboratory is a place for earnest work, where the careless and the indolent do not find an asylum.

Decided progress has been made in the department of zoology. The methods of laboratory instruction and study, which have borne good fruit in other departments, have been introduced here. The work of dissection of all the lower animal forms has been begun and carried to a commendable degree of efficiency, under the scalpel and the microscope. With vigorous effort on the part of the instructor, and cordial support from those in authority, this neglected phase of study may be brought to the high degree of efficiency found in the kindred department of biology, the Botanical laboratory.

In the Mechanical school the evidences are that we have been fortunate in securing a competent and useful instructor. Mr. Woods is doing good work in the obstruser parts of the science of mechanical engineering, and especially excellent work with the students in constructive and mechanical drawing.

Under the authority given by you at the last meeting, an instructor in Elocution has been employed until the end of the present year. The experiment appears to be working satisfactorily, but must be continued into another term before it can be reported upon definitely.

The two ladies continue to do excellent work.

Mrs. Wilkinson tenders her resignation, to take effect at the end of the next term.

The lands in Gage Co., Nebraska, belonging to the University have been advertised for sale, agreeably to your order. A special report will be presented by the committee which has the matter in charge.

A special report of the business transactions of the several departments of the University during the year ending March 1, is presented, at the request of the Executive Committee.

The quarterly report of the Agricultural department is herewith presented.

Attention is invited to a communication from Prof. Burrill, asking authority to institute a series of experiments in silk-raising and in the examination of the evil in bee-hives, known as *foul brood*. Both these subjects seem eminently fit for investigation here, and I hope the limited means asked for prosecuting research will be granted.

Professor McMurtrie presents a list of chemicals and apparatus needed for the year 1884-5. The appropriation and leave to purchase is asked for thus early in the season, in order that opportunity may be given for procuring the articles by importation. The quality of the goods will probably be improved, and the price will be very materially lessened in this way, as all imports can be made free of duty. The plan is in the interest of economy and should be adopted.

The American Educational Association holds its annual session in July next, at Madison, Wisconsin. An extensive exhibit will be made then of all educational methods and appliances, especial attention being given to the products of schools of technology and manual training. The Faculty has considered the question whether this University should be represented there, and respectfully suggests that the College of Engineering be authorized to make an exhibit of its drawing, designing and shopwork, and that an appropriation be made for the expenses of such an exhibit.

Provision should be made at this meeting for issuing the Annual Catalogue. The book entitled "From the Lakes to the Gulf" has been issued. Some of the illustrations to the article on the University will be available for the catalogue. The photographs from which the pictures were made were taken by Mr. Stratton, of the Senior class, and his expense in making them should be paid.

The questions at issue concerning the Illini, which were before you at the last meeting, have been adjusted. The rules of the Faculty affirming general authority of control and supervision are accepted by the students, while the wishes of the students as to method of electing the managers of the paper have been gratified. The Business Manager of the Illini renews his request for aid from the Trustees to buy a new font of type, and I recommend that $75 be appropriated for that purpose.

I have been obliged to employ a student as assistant in the Physical Laboratory, and I ask that an appropriation of $7.50 per month for the winter and spring terms be made for this purpose.

Respectfully submitted,

S. H. PEABODY, *Regent*

The reports from Prof. T. J. Burrill, of the Horticultural Department, and from Professor G. E. Morrow, of the Agricultural Department, were received, and ordered on file.

A request from Professor Wm. McMurtrie, of the Chemical Department, for the purchase of chemicals and apparatus for the next academic year, not to exceed $514.60, was granted.

The request of Executive Committee "that the Regent should make out a report of the work of the different departments of the University," was read, and the following report presented by the Regent:

To S. H. Peabody, Regent of the Illinois Industrial University:

DEAR SIR—The Board of Trustees have long felt the need of some more definite knowledge of the methods of operating the various departments of the University—the work accomplished as well as the cost of such work.

The Executive Committee therefore respectfully request that you call to your aid the heads of the several departments, and collate, in some convenient form, the work accomplished, the cost to the respective departments, the methods of work, giving results for such a period as will demonstrate the real work of each department, together with such suggestions as may be of use to the Board.

Such facts and suggestions the committee would be pleased to have before the March meeting of the Board, 1884.

Respectfully yours,

S. M. MILLARD,
CHAS. BENNETT,
J. T. PEARMAN.
Executive Committee.

To the Trustees of the Illinois Industrial University:

GENTLEMEN—In response to a request from the Executive Committee, I beg leave to present the following special report, concerning the affairs of such departments of the University as carry on extended business transactions collateral to their educational duties.

I ask permission to present a few prefatory suggestions:

1. It seems evident that none of these departments were at first established, or exist now, primarily for business purposes. Each is and should be an essential part of the educational mechanism of the University, and its business relations are merely secondary and incidental. The farms, the shops, the laboratories are organized for purposes of instruction or of scientific research. If the results in any of these departments can be made more valuable or practical by the introduction of commercial business, such introduction is proper, and if, farther, such work may make the department wholly or in part self-supporting, that result may be gratifying, but should never be demanded as a criterion of usefulness to the University. On the other hand, if the introduction of commercial business in any department should be found to impair the efficiency of that department as a means of instructive or scientific usefulness, that work should be laid aside even if it might add its moiety to the finances of the University.

If, then, it should appear that a department is a source of expense to the University, that fact should not be charged against the department as a demerit, provided the department is otherwise administered in a way to furnish valuable educational or scientific returns.

The farms should not furnish an exception to this general principle. But it happens that we have a quantity of land larger than is needed for ordinary purposes of experiment. The usual investigations of soils, seeds, manures, methods of culture, etc., may be efficiently conducted on a much smaller area of land. But the management of a large farm is in itself an experiment of great importance, and it affords an opportunity for a class of experiments in breeding, feeding, etc., which could not as well be conducted upon a smaller scale or area. In these experiments the question of profit becomes important. It is right to ask of operations of such breadth not only what do they teach? but also, does it pay? Yet even here the experiment will be accompanied with increased expense, and this expense will reduce the profits.

In this connection it seems proper to say that the Griggs Farm should not be counted as part of the agricultural domain of the University. It is an outlying body of land too far from the University Farm to be economically managed in connection therewith, even if the latter were not already quite large enough for its legitimate purposes. It is simply a piece of property which the University holds until such time as it may be profitably converted into some other form of capital, like the lands owned by the University in Nebraska or Minnesota. It should, firstly, pay its own expenses, without draft on the profits of the University Farms, and if beyond that it yields any income, that should be turned over at once to the University treasury. Neither its profits nor its expenses should figure in the balance sheet of the University Farm.

2. The Agricultural department is the only one which has hitherto regularly and formally reported a statement of its business transactions, other than the aggregates of income and outgo found in the tabular statements of the Business Agent. While the prosperity of a department is not to be determined simply by the fact that it is either making or losing money, this may yet be an important factor in making up a conclusion. At all events it would seem to be important that the Trustees should know what the facts are.

It will not be easy for any of the departments to make an exact statement, now, as it would be if accounts had been kept with such a report constantly in view, yet it is believed that no important discrepancies exist.

The report of the Agricultural department was made at the last meeting to December 1, 1883. As an inventory of property is taken only once each year, and that in December, it will not be easy to compare exactly the present condition with that of March 1, 1883. It is thought that the statements of the last report will be sufficient for the purposes of this inquiry, especially as the aggregate of farm products for the season cannot have changed materially since that date.

The lands in Urbana and Champaign belonging to the University may be classed thus:

Lands used for agricultural purposes:		
The Experimental farm, acres	90	
The Stock farm, acres	410	
		500
Lands used for horticulture, etc		53
Lands used for public grounds		33
Roads, internal and external plats for yards, etc		34
		610
The Griggs farm		160
Total acres		770

The agricultural lands have been used thus:		
In pasture		160
In meadow		160
Tillage:		
Corn	80	
Oats	55	
Rye	33	
Wheat	8	
Miscellaneous	4	
		180
Total acres		500

Of this land 20 acres have been used specially for experimental purposes.

The products of tillage, estimated in part, were in 1883:

Corn, bushels	2,800	
Oats, "	2,285	
Rye, "	652	
Wheat, "	160	
		5,897
Hay, tons		275

The land devoted to experiments was used in testing varieties of corn, wheat, millet; effects of rotation; continuous cultivation of same crops; use of fertilizers.

Experiments were conducted in feeding of stock; use of ensilage, etc.

The Dairy House has used the milk of cows averaging about 16.

There were sold, of butter, 2,648 pounds at 25 cents	$662 00
Of milk, gallons	38 00
	$700 00

The cows milked are mostly of blooded strains and are kept primarily for the rearing of calves. No account is made of the skim-milk, which with some additions of proper nutriment has been fed to the calves, with excellent success.

The labor special to the Dairy house has cost	$380
Leaving balance of profit in this specialty	320
	$700

Fences. There are on the two farms, approximately:

Hedge fence, miles	5.
Board, or board and wire, miles	1.50
Wire, miles	1.
Rail	.50
Total miles	8.

All rail fence has been reset and repaired within the year. One mile of wire, and board and wire fence has been built. All the hedge fence has been trimmed; about one-third has been trimmed twice. One-eighth of a mile has been plashed. The cost of labor on fences, estimated at $60.

Balance Sheet of Agricultural Department December 1, 1883.

Credit.			
Inventory December 1, 1883:			
Live stock	$10,301 00		
Farm products	2,065 00		
Teams	1,275 00		
Machinery and tools	1,900 00		
		$15,541 00	
Sales:			
Live stock	$4,787 00		
Butter and milk	700 00		
		5,487 00	
Grain, hay and straw		1,263 00	
Labor for other departments	$272 55		
On experiments, etc	90 00		
		362 55	
			$22,653 25
Debit.			
Inventory December 1, 1882:			
Live stock	$8,351 00		
Farm products	4,068 00		
Teams	1,400 00		
Machines and tools	1,846 25		
		$15,665 25	
Paid for superintendence	$150 00		
For labor	3,187 30		
		3,337 30	
Stock purchased		1,417 64	
Machines, tools and repairs	$331 42		
Ordinary repairs	268 40		
Special food and medicine for stock	84 65		
Seeds, freight, advertising, etc	86 17		
		770 64	
			21,190 83
Profits from year's work			$1,462 32
Paid for permanent improvements		$594 05	
Cash balance to treasury		868 27	
			$1,462 32

The horticultural lands include the orchard, the forest plantation, and grounds used for culture of grapes and small fruits, and for nursery and garden.

All these lands are used, in a very direct sense, for experimental purposes. The orchard and the tree plantation were among the earliest enterprises undertaken by this department, and they necessarily require a very considerable number of years for the cycle of their investigations. It is expected that Professor Burrill will prepare a detailed account of each of them, and will present them to you in season to form part of the next biennial report.

The plant house is an important adjunct to botanical and horticultural instruction. It should be, and it is, at once a place for instruction in methods of management, a propagating house, and a museum of living plants. When compared with the plant houses of similar institutions, its capacity is found to be very limited, and its ratio of cost to results is thereby much increased. The effort has been to raise plants for sale, with a view to make it nearly self-sustaining, but this effort has been only in part successful. This is difficult, because of the limited room in the greenhouse, and the limited market. The dimensions of the greenhouse give about 3,200 square feet, with space for plants about 2,400 square feet.

The lands in this department are used thus:

In orchard	30 acres
Forest plantation	15 "
Small fruits and grapes	6 "
Garden and nursery	2 "
	53 acres

The public grounds. The care of these has been an adjunct of the Horticultural department, under the supervision of Prof. Burrill. They are:

1. *The old campus and drill ground.* This tract, containing about eleven acres, has lost the importance it had when it was graced by the old dormitory building. It is useful in the months of spring and autumn as a drill ground for the battalion. Its expense is only the maintenance of the fence, and the occasional cutting of the grass during term time. In the long vacation it gives a crop of hay.

2. *The arboretum*, containing about seven acres. This piece of ground is planted with forest trees in great variety. The fence on the north end has lately been moved to include the lots lying between it and the horse railway. The expense of this tract is little more than the care of fences and work; the grass pays for its cutting.

3. *The college park*, which contains about fifteen acres, mostly devoted to public uses. Considerable effort is expended on this piece of ground to make it ornamental and attractive, by keeping its fences, hedges, lawns, walks, drives, shrubbery and trees neat and beautiful, and making it a good example of landscape gardening. Besides the constant care of grass and flower plantings, some expense has been made on this ground in relaying the drains from the main building, laying water-pipe, grading, etc. In the estimates of expense, credit is given to the greenhouse for a quantity of plants furnished; they have cost the greenhouse something, but no return has ever been made to that department in the keeping of accounts.

A considerable part of the work on these grounds has been done by Janitor Baker, and part of his wages might be charged against this account.

Balance Sheet of Horticultural Department, March 1, 1883, *to March* 1, 1884.

Credits.			
Sales:			
Orchard	$12 13		
Small fruits	158 63		
Nursery	14 65		
		$185 41	
Sales:			
Greenhouse	$371 72		
Plants for public grounds	300 00		
		671 72	
			$857 13
Debits.			
Labor, orchard and forest	$35 00		
Small fruits and nursery	73 28		
		$108 28	
Greenhouse:			
Labor	$632 52		
Fuel	155 00		
Pots, plants, &c	51 26		
Repairs	120 80		
		959 58	
			1,067 86
Balance, loss			$210 73

Expense Account of Public Grounds.

	Expense.	Proceeds.	Balance.
Old Campus	$10 00	$10 00	
Arboretum	10 00		$10 00
University Campus:			
Labor	482 37		
Material	133 68		
Plants from Greenhouse	300 00		
			916 05

Of this sum about $200 may be credited to permanent improvement.

The Griggs Farm has been leased during the last year to F. G. Jaques. Up to December 1, 1883 the rate of rental was $3 per acre. Since that date the rate has been advanced. This farm has been in bad condition, fences needing repair and a considerable area requiring drainage. The determination to perfect the drainage was made last summer by the Farm Committee, and the work has been done since as fast as opportunity has offered.

There has been expended on the farm within the year:

For fencing	$5 35	
For tile and ditching	668 45	
		$673 80
The receipts have been		$480 00
Leaving to be paid from the rental of the current year		193 80
		$673 80

THE CHEMICAL DEPARTMENT.

The business transactions of this department consist in the sale of chemicals, apparatus, gas, etc., to students. These materials are purchased in bulk, and are furnished to the students at as low prices as are possible without loss to the department. A custom had grown in this department of furnishing to assistants their chemicals and other material free of charge, and a very considerable loss has thus fallen upon the laboratory. This matter being brought to my notice, I ruled that assistants should pay for the material used by them in the prosecution of their own studies, at the same rates charged to other students. If the wages paid to assistants are inadequate they should be raised, but by definite payments rather than by indefinite perquisites. The professor in charge has also revised the system of keeping accounts, with decided advantage to the finances of the laboratory.

Balance Sheet.

Credits.		
From State appropriations	$649 42	
Students, for materials	697 33	
Other sources	4 22	
		$1,350 97
Debits.		
For apparatus and chemicals	$896 18	
gas	233 00	
repairs and plumbing	83 41	
freights, etc	30 00	
printing	11 00	
		$1,253 59
Balance to credit of department		$97 38

Credits might properly be added for material:	
To other departments	$19 85
To assistants	174 00
	$193 85

THE MACHINE AND CARPENTER'S SHOPS.

Three purposes are served by these shops:

1. They furnish the means of instruction in practical art to students who take kindred courses of study.

2. They assist in paying expenses by profits on commercial work.

3. Incidentally to the latter they furnish to some students the means of earning some money by which to help them through the University. While this item has its usefulness it should not be expected to yield much profit to the treasury, nor should it be allowed to become a drain upon resources.

To understand what the shops are doing, we must first ask what they would cost if they earned nothing, that is, if used only for instructional work. Evidently there would be outlay at first for building, engine, machinery, tools, etc., and an annual cost for tools, power, material and instruction. If operated only as a means of teaching, the shops would be a constant cost to the treasury diminished by whatever the legislature might appropriate for the purpose.

If other work be done in the shops, then any amount which shows a diminished aggregate of expense as compared with the aggregate which would appear if no work of this kind were done, may be set down to the credit of the shops.

The call for commercial work has greatly diminished since the shops were opened. The machine shop especially gets now very little, chiefly because other shops have been opened nearer the business centers of Champaign and Urbana.

It has been the practice to do the work of the University within its own shops, care being taken to keep the cost as low as it would be if the work were done outside. The work has been done chiefly by our students. Should classes continue to increase it will be necessary to devise some way of providing work for the advanced students by which they may be interested as well as taught.

While the machine shop has less commercial work than the carpenter's shop, it teaches more than twice as many students. The table appended indicates that without commercial work the two shops would have cost the University in the year as estimated $2,360, of which $1,500 would be paid by State appropriation, leaving $860 a charge against the general fund. It also shows that the actual cost to the University was reduced to $1,357.87; in other words that the business of the shops had benefited the general fund by $1,002.13. Including the State appropriations the shops show a credit balance of $142.13 at the same time that they have given instruction to 72 different students, with an average of about 50.

Balance Sheet of Machine and Carpenter Shop, for the year ending March 1, 1884.

	Carpenter's Shop.		Machine Shop.	
Without Commercial Work.				
For materials and tools	$130 00		$130 00	
Power	50 00		100 00	
Teacher	750 00		1,200 00	
		$930 00		$1,430 00
Less State appropriations		500 00		1,000 00
Balances paid from general fund		$430 00		$430 00
Total balance against general fund				$860 00
With Commercial Work.				
Debits.				
For materials and tools	$655 32		$264 53	
Labor	727 76		398 48	
Power	121 81		121 81	
Teacher and foreman	750 00		1,200 00	
		$2,254 89		$1,984 82
Credits.				
Work for University	$1,349 91		$855 01	
Work for other parties	548 64		128 28	
State appropriation	500 00		1,000 00	
		2,398 55		1,983 29
Balance in favor of general fund		$143 66		
Balance against general fund				$1 53
Total balance in favor of general fund		$142 13		
Add estimated loss without commercial work		860 00		
Total balance in favor of shops in consequence of commercial work		$1,002 13		
No. of students taught during the year		22		50
Inventory of stock on hand		$1,104 44		$614 02

General Balance Sheet.

Department.	Loss.	Profit.
Agricultural Department		$1,462 32
Horticultural Department	$210 73	
Chemical Laboratory		97 38
Machine and Carpenter Shop		142 13
Total profits		$1,701 83
Deduct loss		210 73
Net profit		$1,491 10

Trusting that this report will in some measure meet the requirements of the Executive Committee, it is very respectfully submitted.

S. H. PEABODY, *Regent.*

Inventory of Apparatus, Library, Machinery, and other movable property belonging to the Industrial University, March 1, 1884.

Department.	Value of enumerated articles.	Estimated value of other articles.	Value of articles loaned by U. S. Gov't	Total values.
Agriculture	$2,170 80	$13,641 00		
Horticulture and Botany				
Mechanical Engineering	9,685 79	614 62		
Architectural				
Civil Engineering	2,655 90		$79 50	$2,735 40
Physical Laboratory	8,105 22	100 00		8,205 22
Chemical Laboratory	4,616 46			
Blue Printing Laboratory				
Museum of Natural History				
Library	28,574 00			28,574 00
Art Gallery				
Art and Design				
Museum of Engineering and Architecture				
Military and Gymnasium	718 25	75 00	7,030 00	7,823 25
Furniture, etc.				
Heating Apparatus				
Total inventory				
Belonging to U. S. Gov't				
Total in possession of the University				

On motion of Trustee Early, the report was received, and the Executive Committee were authorized to publish it in pamphlet form, for the general information of such as may need or desire it.

A communication from Mr. J. F. Going was referred to the Faculty.

The Board adjourned, to meet March 12, 1884, at 9 o'clock A. M.

SECOND DAY'S SESSION.

The Board met as by adjournment.

Present—Trustees Earle, Follansbee, McLean, Millard and Pearman.

The Business Agent presented the following report, which was read, received, and, together with accompanying vouchers, was referred to the Auditing Committee:

Current Appropriations.

September 4, 1883.	Appropriated.	Receipts also appropriat'd	Expended	Balance.
Board expense	$423 75		$411 38	$12 37
Salaries	17,990 00	{ Current. State....	3,934 28 12,999 60	1,056 12
Buildings and grounds	50 00	263 94	301 15	12 79
Fuel and lights	1,500 00	114 70	2,158 25	
Stationery and printing	300 00		297 00	3 00
Mechanical Department		710 31	729 20	
Architectural Department	497 77	1,065 08	1,110 29	452 56
Agricultural Department	500 00	4,834 58	3,374 67	1,959 91
Horticultural Department		219 29	207 68	11 61
Chemical Department	18 41	520 01	438 43	99 99
Military Department	50 00		32 35	17 65
Library and apparatus	50 00		43 81	6 19
Incidental expense	200 00	21 25	209 27	11 98
Preparatory department		787 50	900 00	
SUNDRIES.				
Physical laboratory	41 96		4 26	37 70
Cabinets	8 85			8 85
Examination of schools	19 20			19 20
Civil engineering	17 51		15 07	2 44
Premium on bonds	300 00		300 00	
Chase lots	450 00		450 00	
Art Department	50 00		48 36	1 64
Hat room	30 63		30 63	
Gymnasium	150 00		68 25	81 75
Mechanical Museum	50 00		81 03	
Nebraska lands	54 20		62 35	
Music fees		68 60	68 60	
Elocution fees		120 00	120 00	
University fees		4,250 25		

State Appropriations.

July 1st, 1883.	Appropriated.	Received.	Expended	Balance.
Taxes on lands, ½ per annum	$5,000 00	$2,469 06	$2,469 06	
Buildings and grounds, ½ per annum	6,000 00	3,000 00	2,971 14	$28 86
Laboratories, ½ per annum	3,000 00	1,500 00	1,238 80	261 20
Mech. and Arch. shops, ½ per annum	3,000 00	1,500 00	815 72	684 28
Books and publications, ½ per annum	3,000 00	1,500 00	720 32	779 68
Cabinets, ½ per annum	2,000 00	1,000 00	155 97	844 03
Current expenses of inst., ½ per annum	28,000 00	14,000 00	12,999 60	1,000 40
Blacksmith shop	2,500 00	2,500 00	2,288 14	211 86
Machines and tools	2,000 00	2,000 00	1,752 77	247 23
	$54,500 00	$29,469 06	$25,411 52	$4,057 54

Mr. John W. Bunn, Treasurer, made the following report, which was received and filed:

ILLINOIS INDUSTRIAL UNIVERSITY,

To John W. Bunn, Treasurer, Dr.

1883.				
Dec. 11	To balance			$12,080 03
1884.				
Jan. 1	" interest on Chicago city bonds	$875 00		
	" " " " "	1,020 00		
				1,895 00
Feb. 29	" am'nt received on acc't Mechanical Department	$286 31		
	" " " " Architectural "	365 84		
	" " " " Agricultural "	1,049 07		
	" " " " Horticultural "	69 25		
	" " " " Chemical "	408 01		
	" " " " Buildings and grounds	171 95		
	" " " " Fuel and lights	6 20		
	" " " " Incidentals	21 25		
	" " " " Music fees	20 60		
	" " " " Elocution	120 00		
	" " " " Tuition in Prep. Dept.	340 00		
	" " " " Students' fees	1,547 50		
	" " " " Ill. Cent. freights	1,084 00		
				5,489 98
				$19,465 01

ILLINOIS INDUSTRIAL UNIVERSITY,

To John W. Bunn, Treasurer, Cr.

1884.				
Feb. 29	By amount paid for Board expense	$171 86		
	" " " Salaries	2,036 27		
	" " " Buildings and grounds	265 87		
	" " " Fuel and lights	1,446 06		
	" " " Stationery and printing	38 00		
	" " " Mechanical Department	345 33		
	" " " Architectural "	295 72		
	" " " Agricultural "	1,248 80		
	" " " Horticultural "	49 72		
	" " " Chemical "	295 40		
	" " " Military "	11 69		
	" " " Library and apparatus	39 56		
	" " " Incidental expense	99 23		
	" " " Preparatory Department	450 00		
				$6,793 42
	" " " Physical laboratory	$2 46		
	" " " Gymnasium	68 25		
	" " " Mechanical museum	81 03		
	" " " Music fees	20 60		
	" " " Elocution fees	120 00		
	" " " Nebraska lands	62 35		
				354 69
	" " " Buildings and grounds	$135 73		
	" " " Laboratories	155 75		
	" " " Mech. and Arch. shops	368 85		
	" " " Books and publications	416 01		
	" " " Cabinets	80 65		
	" " " Current expenses of instruction	6,499 80		
	" " " Blacksmith's shop	31 72		
	" " " Machines and tools	193 00		
				7,881 51
	Balance			4,435 39
				$19,465 01

JOHN W. BUNN, *Treasurer.*

URBANA, March 11, 1884.

The Farm Committee, and the Committee on Buildings and Grounds asked further time for reports due at this meeting. On motion, further time was granted.

The Committee on Sale of Nebraska Lands made the following report; on motion it was received and approved:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—Your committee, appointed to conduct the sale of lands in Gage county, Nebraska, belonging to the University, beg leave to report progress as follows:

Agreeably to your instructions they appraised the lands and advertised them for sale. The prices fixed for the lands with the terms and methods of sale were published in a printed circular of which a copy is herewith appended. The sale was widely advertised in leading papers in Gage county, and elsewhere in Nebraska, in Kansas, Missouri, Iowa and Illinois. A large amount of inquiry has been elicited, all of which has been duly answered.

In accordance with the terms advertised your committee has opened proposals and awarded sales as follows:

To Albert Hubka, of Crab Orchard, Nebraska: The NW. ¼ sec. 12, T. 3, R. 8, 160 acres, at $15.05.

To James T. Applegate, of Macomb, Illinois: The NW. ¼ sec. 4, T. 2, R. 8, 146.60 acres; NE. ¼ sec. 30, T. 3, R. 8, 160 acres; SW. ¼ sec. 30, T. 3, R. 8, 153.65 acres, at $15.30.

On all of these sales a deposit of 10 per cent. has been made and placed in the hands of the Treasurer, but the time is yet too brief for the contracts to be perfected.

Your committee is encouraged by these sales to believe that the plan of sale adopted is feasible, and will prove advantageous to the University. Since the lands were put upon the market the season has been particularly unfavorable for such buyers as wish to visit the lands and judge for themselves as to their location and value. Very many have expressed their intention to do so, and in the opening spring more offers may be expected.

Your committee has expended thus far:

For printing	$31 50
For advertising	47 60
For postage and incidentals	5 00
	$84 10

Respectfully submitted,

S. H. PEABODY,
CHAS. BENNETT,
Committee.

URBANA, ILL., March 11, 1884.

UNIVERSITY LANDS FOR SALE.

The lands belonging to the Illinois Industrial University, situate in Gage county, Nebraska, amounting in all to 9,340 acres, more or less, are hereby offered for sale by regularly numbered quarter sections according to the subdivisions and surveys of the United States Land Office, in quantities to suit purchasers, on the terms and in the manner specified as follows:

Terms—One fourth of the price, cash; the remaining three-fourths deferred to such time as the purchaser may desire, not more than ten years, reckoned from the first day of January next preceding the day of sale; interest on deferred payments payable annually on the first day of January of each year, at eight per cent. per annum. The price of any quarter section to be not less than that set forth in the following list. The buyer must pay all taxes becoming due after the date of the purchase.

Minimum Prices—The prices of the following numbered lands to be not less than fifteen dollars ($15.00) per acre:

In Township 3, Range 7, the south half of Sec. 35.

In Township 3, Range 8, west half Sec. 31.

In Township 5, Range 8, west half Sec. 35.

The prices of the following numbered lands to be not less than fourteen dollars ($14.00) per acre:

In Township 2, Range 8, all of Sec. 5, west half of Sec. 6.

In Township 3, Range 8, SE. ¼ Sec. 12; south half of Sec. 15; SE. ¼ Sec. 30; south half Sec. 34.

The prices of the following numbered lands to be not less than twelve dollars and fifty cents ($12.50) per acre:

In Township 2, Range 8, all of Sec. 3; east half of Sec. 6; north half of Sec. 10.

In Township 3, Range 8, SW. ¼ Sec. 12; all of Sec. 13; south half of Sec. 14; all of Sec. 24; all of Sec. 26; all of Sec. 27; east half of Sec. 35; north half of Sec. 34.

In Township 5, Range 8, east half of Sec. 35.

The prices of the following numbered lands to be not less than ten dollars ($10) per acre:

In Township 2, Range 8, south half of Sec. 2, north half of Sec. 11.

The above described lands were entered on account of the Illinois Industrial University at the United States Land Office in Beatrice, Nebraska, in 1867, with so-called Agricultural College Land Scrip. The patents for the same are in the possession of the University, without incumbrance, and all taxes have been paid. The University will convey to each purchaser, on completion of all payments and accrued interest, the title thus acquired.

Method of Sale—Proposals for any of the above named lands may be deposited with the Regent of the University at his office in Urbana, Illinois, which proposals will state for each quarter-section separately, the number of the quarter-section desired; the price offered per acre, which must not be less than that found in the foregoing list; the time asked for deferred payments, not more than ten years; the rate of interest offered, not less than eight per cent. per annum. Each proposal must be accompanied with a certificate of deposit in some United States National Bank, endorsed to the order of John W. Bunn, Treasurer of the Illinois Industrial University, for a sum of money not less than ten per centum of the whole amount offered for the quarter section proposed for. The proposals will be opened at the University as they are received; if proposals for the same tract of land should be received at the same date from two or more parties, the tracts proposed for will be awarded severally to the parties whose offers, conforming to the conditions above specified, are deemed most advantageous to the University.

Should proposals, otherwise acceptable, but identical in price and terms, be made for the same quarter section by two or more parties, the award will be referred to the Executive Committee of the Trustees of the University for its determination. Should any bid be unsuccessful, the accompanying certificate of deposit will be immediately returned to the depositor thereof. Successful bidders will be notified immediately, by letter mailed to the address in their proposals, and deeds or contracts will be prepared without delay. Within thirty days of the date of the award, a payment of not less than fifteen per cent. of the whole amount of the price offered, must be made in addition to the ten per cent. already deposited, and the deeds or contracts must be perfected and taken by the purchaser, under penalty of forfeiture to the University of the ten per cent. deposited with the proposals for the land.

Proposals may be made at any date for all of the lands not at that date sold, but the price offered must not be less than twelve dollars and fifty cents ($12.50) per acre for the whole body of lands then on sale, of which ten per cent. must accompany the proposal in the manner above described, and fifteen per cent. more be paid within thirty days; the balance of the price may be upon deferred payments bearing annual interest at eight per cent. per annum, the time of such payments being subject to negotiation. Such proposals will take precedence of any other offers made at the same time.

The University reserves the right to change the above prices or to withdraw any portion or all of its lands from sale at its option.

Forms of proposals and other information may be had of Burnham, Trevett & Mattis, at Beatrice, Nebraska, or of S. H. Peabody, Regent of the University, post-office, Champaign.

By order of the Board of Trustees.

CHARLES BENNETT,
SELIM H. PEABODY,
Committee.

URBANA, ILL., March 15, 1884.

On motion of Trustee Earle, it was

Resolved, That it is the sense of this Board of Trustees that the authority conferred upon the special committee appointed at the December meeting for the sale of Nebraska lands, was intended to be complete and to repose in that committee full powers of sale or lease in such a manner and at such times as they may choose, not exceeding the limits and terms granted in the authority heretofore conferred.

The following resolution was passed:

Resolved, That the Regent be requested to tender to Professor S. A. Forbes the position of Professor of Zoology and Entomology in this University, and, if possible, perfect negotiations with him to that effect.

The Auditing Committee submitted the following report:

ILLINOIS INDUSTRIAL UNIVERSITY,
CHAMPAIGN, March 12, 1884.

To the President and Members of the Board of Trustees I. I. U.:

The undersigned, your Auditing Committee, would respectfully report:

That we have examined the vouchers and accounts numbered 201 to 400, inclusive, and find the same correct, and ask that the report of same, as made out by Business Agent, be made part of this report, and that the vouchers be filed.

Respectfully submitted,

ALEX. McLEAN,
G. A. FOLLANSBEE,
Committee.

The report was received and approved.

The resignation of Mrs. Abbie Wilkinson as teacher of music was received and laid over until next meeting of the Board.

On motion of Trustee McLean, the amount of money expended in sale of Nebraska lands, as presented in the report of committee, was audited and allowed.

On motion of Trustee Earle, an amount not to exceed $110 was appropriated for experiment in bee culture and silk-worm raising, as recommended by Prof. Burrill.

An amount of $100 was appropriated for the exhibition of students' work at the Exposition of the Work of Technical Institutions, at Madison, Wisconsin.

The question of exhibiting at the Exposition at New Orleans was referred to a committee consisting of Trustee Earle, the Regent and Executive Committee.

A communication from Mr. J. R. Scott was referred to a committee of three (the Regent, Trustees Pearman and McLean) for investigation and report at the next meeting.

The following appropriations were made:

$300 for printing Catalogue 1883–84.

$75 for font of type for Illini office.

$45 for salary of assistants in Physical Laboratory.

$7.50 for photographic work for Catalogue.

$180 for instruction in elocution.

Authority was given to the Regent and Faculty to issue the University Catalogue for 1883–84.

The house rent of the gardener, Mr. Klingenspor, was remitted for the balance of the year.

The President nominated the Standing Committees, as follows:

Executive: Millard, Pearman, Bennett.

Farm: Pearman, Earle, Bennett.

Buildings and Grounds: McLean, Follansbee, Postel.

Auditing: Paden, Postel, Bennett.

Finance: Bennett, Follansbee, Paden.

The following appropriations from current funds for the next six months were made:

August 31, 1884.	Appropriated.
Board expense	$300 00
Salaries	16,590 00
Buildings and grounds	100 00
Fuel and lights	1,000 00
Stationery and printing	800 00
Architectural Dept. bal	452 56
Agricultural Dept. bal	1,959 91
Horticultural Dept. bal	11 61
Chemical Dept. bal	99 99
Library and apparatus	50 00
Military Dept	50 00
Incidental expense	200 00
	$21,614 07
Sundries—	
Physical Laboratory bal.	$37 70
Cabinets, bal	8 85
Examinations of Schools	19 20
Gymnasium Schools	81 75
	$21,761 57

Adjourned.

S. M. MILLARD,
President.

E. SNYDER,
Recording Secretary.

BOARD MEETING—JUNE 1884.

The Board met in the University parlor June 10, 1884, at 3 P. M.

Present—Trustees Bennett, Earle, McLean, Millard and Pearman.

Absent—Gov. Hamilton, Trustees Cobb, Follansbee, Landrigan, Paden and Postel.

The minutes of the last meeting were read and approved.

The Regent presented the following report:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The college year which now closes may be counted a year of successful progress in the history of the University. Several of the questions which have hitherto been disturbing elements, have been satisfactorily and, it is believed, happily settled. Conspicuous among these may be mentioned the student's government, which was a year ago laid aside by the concurrent action of students, faculty and trustees. It seems to have been agreed by all parties interested that this experiment in collegiate discipline had been carried far enough, and that it should cease. It would be difficult to find, among either of the three bodies concerned, any considerable number who desire or approve the revival of the system.

The influence of this action upon the discipline of the University, and upon the demeanor of the young men and women assembled here, can not be objected to. So far as careful observation can determine there has been no year in the last half dozen in which the habitual good order of students at the University and in the adjacent cities has been better than during the year now closing.

The conclusion of the whole matter seems to be that a very serious disturbing element has been eliminated without apparent detriment to any valuable interest of the university.

The annual catalogue just issued gives for the year the aggregate attendance of 261 gentlemen and 69 ladies, or 330 in all. The attendance in all the technical courses is fully equal to that of last year, and greater than in preceding years. The deficiencies in numbers will be found almost entirely in the college of literature and science. This result, variously as it may be interpreted, will at least show that the drift of the University is not away from the practical work which so many of its friends advocate.

The graduating class numbers forty-two, and has in this respect been surpassed but once. The following named persons are recommended by the Faculty for degrees and certificates, respectively, as specified:

LIST OF GRADUATES.

B. S. College of Agriculture.—Thomas F. Hunt, George W. McClure, Edmund R. Vial.

B. S. College of Engineers.—(School of Mechanical Engineering). Frank E. Herdman. (School of Civil Engineers). Henry H. Barber, Arthur C. Brancher, Frederic A. Lietz, Lewis C. Roberts, Lucius N. Sizer, Hubert A. Stevens.

B. S. College of Natural Science.—(School of Natural History). Alma E. Brancher. (School of Chemistry). Fred W. Eberlein, Edwin R. Kimball, Charles H. Lilly, Charles Montezuma, Samuel N. Parr, Ernst Speidel, Henry S. VanPetten.

B. L. College of Literature and Science.—(School of English and Modern Languages.) Nettie Ayers, Ella U. Barber, Juniata G. Campbell, Anna J. Conkling, Lola D. Ellis, Georgetta Kemball, George N. Morgan, Andrew O. Rupp, Keturah E. Sim, Laura B. Smith, Jerome G. Wills.

B. A. College of Literature and Science.—(School of Ancient Languages). Emmet G. Bartholf, William J. Bartholf.

M. L. College of Literature and Science.—Arch. O. Coddington. (Certificates). William L. Abbott, James Austin, Guy H. Babcock, Norman W. Chapman, Lucy J. Clark, Lucy A. Hall, Cora J. Hill, Josephine Krause, James E. Lilly, Solon Philbrick, Samuel W. Stratton.

The following named persons, having fulfilled the necessary conditions, have been recommended to his excellency, Gov. Hamilton, and his commissions, as captains by brevet in the State militia, will be presented to them with their diplomas at commencement. Guy H. Babcock. Frank E. Herdman, Solon Philbrick, Lewis C. Roberts, Lucius N. Sizer, Samuel W. Stratton.

Agreeably to instructions received from you at your last meeting, I have tendered to Professor S. A. Forbes, of Normal, the appointment to a chair of Zoology and Entomology in this University at a salary of $2,000 per annum. Professor Forbes has signified his acceptance of this appointment, and that he will enter upon the discharge of its duties at the opening of the next winter term in January, 1885.

It is understood that he will continue to discharge the duties of the office of State Entomologist, and that that office will be removed to the University. If, in the sequel, other important scientific interests should find a home, and a genial relationship here, it is believed that the evident gains to both parties resulting from such an alliance, will not be accompanied with detriment to any other interest in the State.

The University may surely be congratulated upon the acquisition of so valuable an instructor and so distinguished a naturalist as Professor Forbes. I am confident that the Trustees and the Faculty will support him in every reasonable way.

The officers of the army and navy, detailed for duty here, Lieut. Charles McClure and Assistant Engineer Arthur T. Woods, are proving themselves very able men and efficient instructors. The late exhibition drill was very highly praised by the officers who came here to inspect and judge the performance, one of them having performed the same service last year. The battalion appears to have lost none of the excellence it had acquired under Lieut. Wood.

Miss E. M. Hall, as a classical scholar and teacher, has done work of superior excellence; her management of the young ladies has not required and does not need great effort; it has been quiet, efficient and satisfactory. I recommend her re-appointment.

Miss M. E. Darrow has performed her duties with great fidelity. I concur in the recommendation of the professor of modern languages that her engagement be continued.

Mr. Arthur W. Palmer, Assistant in the Chemical Laboratory, declines a reappointment, in order that he may prosecute his chemical studies. The professor of chemistry would be glad to retain his services. He names Mr. Howard Slawson, first assistant in the year 1882-3, to be re-appointed, and I concur in the nomination.

I recommend that Mr. William A. Wetzel be re-appointed Instructor in Elocution, with a salary of —— per month, and the fees derived from the students in elocution.

Mrs. Wilkinson's resignation will require a reorganization of the musical department. Some arrangement should be made looking toward a development of this department, or it should be dropped entirely.

The current list of professors and instructors is presented with the hope that you will continue to approve their work by re-appointment.

Professors Snyder, Ricker and Roos ask leave of absence for the summer vacation.

The sources from which appropriations will be asked for the needs of various departments, are as follows:

1. The balance which remains between receipts and expenses of the current year ending August 31, next, is $586.25.

2. The receipts of rent from Nebraska lands, $596.

3. The balances from State appropriations to July 1 1884, as shown in the report of the Business Agent.

4. The State appropriation for buildings and grounds for 1884-5, available July 1, 1884, $3,000.

The following items are asked for:

1. From balance of current year:
   - For models for School of Art and Design..... $75 00
   - For apparatus and repairs. School of Civ. Eng..... 30 00
   - For desks and drawing paper, School of Architecture..... 42 00
   - For clerical work in preparing catalogue of Library 75 00

2. From account rent of Nebraska Lands:
   - An appropriation to cover expenses of selling and renting, as reported by Com. on Neb. lands..... $165 68

3. From appropriation (State) for Mech'l and Arch's Shops 1883-4:
   - For new benches for Carp. Shop 12x20..... $240 00

These are asked by both professor and foreman, and are much needed.

Authority is asked to use the balance of appropriation for
Machines and tools, in purchase of small wood-lathes, with needful belting and shafting, for joint use of Machine and Carpenter Shops..... 235 97

The construction of cupola to go in Blacksmith Shop, now under way by students' work, etc., will exhaust balance of the appropriation for Blacksmith's Shop.

4. From appropriation for Buildings and Grounds, 1884-5:
   For finishing fence on Greene st. already ordered $280 00
   For new cases in Prof. Burrill's room, finishing the room below in basement, and connecting the two by a stairway, as per plans and estimates herewith 300 00
   For repairs to plumbing in Chemical Laboratory 400 00
5. From State appropriations, 1884-5, for books and publications:
   For binding 100 00
6. From State appropriations, 1883-4, for cabinets:
   For employment of assistant on Herbarium 50 00

All of which is respectfully submitted,

S. H. PEABODY.

URBANA, June 11, 1884.

The report was received.

The Committee on Sale of Nebraska Lands submitted the following report:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—Your Committee on Sale of Nebraska Lands beg leave to report their proceedings for the quarter ending with date, as follows:

1. The sales reported at the last meeting of the Board have been perfected, contracts exchanged, and the twenty-five per cent. of purchase money received in cash has been turned over to the Treasurer.

2 Propositions have been received and accepted for three other tracts; one at $15, and two at $12.50 per acre. The contracts for these sales are not yet completed.

The total sales to date are as follows:

Number of tracts sold, 7.

Number acres sold, 1,093.68.

Prices, 1 tract at $15.05; 3 at $15.30; 1 at $15; 2 tracts at $12.50.

The aggregate proceeds of land sold are $15,749.84.

Cash payments, when contracts are complete, $3,937.46.

Deferred payments, bearing 8 per cent. interest, running variously from three years to ten years, $11,812.38.

Cash received, and turned over to Treasurer, $2,362.46.

The expenses of sales have been:

Approved at last meeting	$84 10
Offered for approval:	
Printing and stationery	$6 85
Expressage	1 00
Advertising	20 40
Total for quarter	$28 25
Total expense of sales to date	$112 35

2. Your committee arranged with Mr. C. E Baker, representing the firm of Burnham, Trevett & Mattis, at Beatrice, to rent such lands as were not sold. They were to be rented for grazing and grass only, and for the current season, ending Oct. 10, 1884. Mr. Baker's compensation for this business was to be five per cent. of the amount of the rents collected. All leases have been signed by your committee, after approval.

Pursuant to this arrangement—

Twenty-nine (29) quarter sections have been leased, for cash paid in advance, amounting to		$596 00
Deduct commissions at 5 per cent	$29 80	
Expenses paid at Beatrice—		
Advertising	$14 50	
Expense	9 03	
	23 52	
		53 33
Balance turned over to Business Agent		$542 67

3. The whole number of tracts (quarter sections) of University lands in Gage Co., referred to your committee, is 59. Of these, twenty-nine (29) have been leased and seven (7) sold, making thirty-six (36) in all. Twenty-three (23) tracts are as yet neither sold nor leased. Many of these are occupied by graziers, who should be compelled to pay rent, or cease occupation. Your committee has directed Mr. Baker to take the necessary preliminary steps, by way of publishing notices in the county papers, and serving notices to the trespassers individually, requiring them to cease their trespassing. Your committee is convinced that the trespassers must be removed by legal process, if necessary, or it will not be possible again to lease any portions of the land, and will make trouble with sales. It is hoped that no legal process will be necessary, and doubtless a single case would be sufficient to settle the whole matter. Your committee ask on this point the advice and authority of the Board.

Respectfully submitted,

CHAS. BENNETT,
S. H. PEABODY,
Committee.

URBANA, June 11, 1884.

On motion the report was received and placed on file.

Messrs. McLean and Pearman were temporarily appointed on Auditing Committee, vice Paden and Postel, absent.

A committee from the Alumni Association, appointed to confer with the Board in the matter of better advertising the University, were given a hearing.

The Treasurer presented his report, which was read, received and referred to the Auditing Committee.

ILLINOIS INDUSTRIAL UNIVERSITY,

To John W. Bunn, Treasurer, Cr.

1884.			
March 11	By balance		$4,435 39
" 31	By amount rec'd on acc't of students' fees	$1,500 00	
	" " " Preparatory Department	145 00	
	" " " Elocution fees	10 00	
			1,655 00
April 1	By interest on Douglas Co. school bonds		100 00
May 31	By am't rec'd on acc't of D. Gardner & Co	$402 00	
	" " " interest on Leib note	250 00	
	" " " Nebraska lands	542 67	
			1,194 67
	By am't rec'd on acc't of Chemical Department	$344 31	
	" " " Horticultural "	437 19	
	" " " Agricultural "	1,634 00	
	" " " Architectural "	108 38	
	" " " Mechanical "	15 50	
	" " " Buildings and grounds	48 50	
	" " " Students' fees	1,387 50	
	" " " Preparatory Department	175 00	
	" " " Elocution fees	122 50	
	" " " Fuel and lights	60 33	
			4,333 21
			$11,718 27

ILLINOIS INDUSTRIAL UNIVERSITY,

To John W. Bunn, Treasurer, Dr.

1884.				
May 31	To amount paid on acc't of Board expense	$85 96		
	" " " Salaries	7,149 89		
	" " " Buildings and grounds	89 69		
	" " " Fuel and lights	423 06		
	" " " Stationery and printing	153 10		
	" " " Mechanical Department	172 23		
	" " " Architectural "	84 80		
	" " " Agricultural "	565 46		
	" " " Horticultural "	264 72		
	" " " Chemical "	43 10		
	" " " Military "	36 85		
	" " " Library and apparatus	2 63		
	" " " Incidental expense	43 11		
				$9,114 60
	To amount paid on acc't of Preparatory Department			450 00
	" " " Elocution	$220 00		
	" " " Silk worm expense	10 00		
	" " " Examination school	24 89		
	" " " Illini type	75 00		
	" " " Nebraska lands	94 00		
				423 89
	State appropriations:			
	To amount paid on acc't of Current expenses	$1,000 40		
	" " " Building and grounds	28 86		
	" " " Laboratories	3 20		
	" " " Mech. and Arch. shops	236 06		
	" " " Books and publications	328 42		
	" " " Blacksmith shop	8 61		
	" " " Machinists' tools	11 26		
				1,616 81
	Balance			112 97
				$11,718 27

URBANA, June 10, 1884. JOHN W. BUNN, *Treasurer.*

The Board then adjourned to meet at 8 o'clock P. M.

EVENING SESSION.

The Board met as by adjournment.

Present—Trustees Bennett, Earle, McLean, Millard and Pearman.

The expenses incurred in sales of Nebraska lands, as per report of committee, amounting to $28.25, were audited and allowed.

Trustees Bennett and Earle were temporarily added to the Committee on Buildings and Grounds.

The Business Agent submitted his report, which was read, received, and, with the accompanying vouchers, referred to the Auditing Committee.

Current Appropriations.

March 14, 1884.	Appropri't'd	Receipts also appropri'ed	Expended.	Balance.
Board expense	$300 00		$85 96	$214 04
Salaries	16,590 00		7,149 89	9,440 11
Buildings and grounds	100 00	$48 50	87 69	58 81
Fuel and lights	1,000 00	60 33	423 06	637 27
Stationery and printing	800 00		153 10	646 90
Mechanical department		18 50	172 23	
Architectural "	452 56	108 38	84 80	476 14
Agricultural "	1,959 91	1,634 00	565 46	3,028 45
Horticultural "	11 61	437 19	264 72	183 47
Chemical "	99 99	344 31	43 10	401 20
Military "	50 00		36 85	13 15
Library and apparatus	50 00		2 63	47 37
Incidental expense	200 00		43 11	156 89
Sundries—				
Physical laboratory	37 70			37 70
Cabinets	8 85			8 85
Examination of schools	19 20		24 89	
Gymnasium	81 75			81 75
Illini type	75 00		75 00	
Silk worm experiment	100 00		10 00	90 00
Bee experiment	10 00			10 00
Nebraska lands	84 10	542 67	74 00	532 77
Elocution	180 00	132 50	220 00	92 50
Exposition at Madison	100 00			100 00
Preparatory year fees		320 00	450 00	
University fees		2,887 50		

State Appropriations.

July 1, 1883.	Appropriated.	Received.	Expended	Balance.
Taxes on lands, ½ per annum	$5,000 00	$2,469 06	$2,469 06	
Buildings and grounds "	6,000 00	3,000 00	3,000 00	
Laboratories "	3,000 00	1,500 00	1,242 00	$258 00
Mech. and Arch. shops "	3,000 00	1,500 00	1,051 78	448 22
Books and publications "	3,000 00	1,500 00	1,048 74	451 26
Cabinets "	2,000 00	1,000 00	154 97	845 03
Current expenses of inst'n "	28,000 00	14,000 00	14,000 00	
Blacksmith shop	2,500 00	2,500 00	2,296 75	203 25
Machines and tools	2,000 00	2,000 00	1,764 03	235 97
Total	$54,500 00	$29,469 06	$27,028 33	$2,441 73

Adjourned to 8 o'clock A. M., June 11, 1884.

SECOND DAY'S SESSION.

The Board met pursuant to adjournment.

Present—Trustees Bennett, Earle, Follansbee, McLean, Millard and Pearman.

Mr. Taylor, of Kankakee, was introduced to the Board, and presented a proposition to refund certain Kankakee county bonds.

On motion, the President of the Board and Trustees Bennett and Follansbee were appointed a committee to confer with Mr. Taylor, County Agent of Kankakee, on the subject of refunding certain bonds of said Kankakee county, now held by the University, and report to this Board.

On motion, the following named students were granted degrees and diplomas (see Regent's Report).

Adjourned to 2:30 P. M.

The Board met as by adjournment.

Present—Trustees Bennett, Earle, Folliard-bee, McLean, Millard and Pearman.

On motion, the following resolution was passed:

Resolved, That the President and Secretary be, and they are hereby authorized, to draw an order on the State Auditor for the several State appropriations falling due July 1, 1884.

The following professors and instructors were appointed for the next academic year:

T. J. Burrill, Prof. of Horticulture.....
S. W. Shattuck, Prof. of Mathematics.....
Edward Snyder, Prof. of Modern Languages.....
Joseph E. Pickard, Prof. of English Literature.....
N. C. Ricker, Prof. of Architecture.....
J. D. Crawford, Prof. of History and Ancient Language.....
O. L. Morrow, Prof. of Agriculture.....
F. M. Prentice, Prof. of Veterinary Science.....
Peter Roos, Prof. of Drawing and Designing.....
L. O. Baker, Prof. of Civil Engineering.....
Wm. McMurtrie, Prof. of Chemistry.....
S. A. Forbes, Prof. of Zoology and Entomology.....
J. Soederbergh, Asst. Prof. of Math. and Civil Engineering.....
Chas. W. Rolfe, Asst. Prof. of Natural History.....
E. M. Hall, Instructor in Ancient Languages.....
M. E. Darrow, Instructor in Modern Languages.....
E. A. Kimball, Foreman of Machine Shop.....
G. W. Parker, Foreman of Architectural Shops.....
Howard Slauson, Assistant in Chemical Laboratory.....
Arthur T. Woods, Assistant in Mechanical Engineering.....
W. A. Wetzel, Janitor.....
A. B. Baker, Janitor.....

The following appropriations were made:

From State Appropriations for 1883.

$240.00, benches in carpenter shop, Shops.
$50.00, herbarium, Cabinets.
$235.97, tools and materials.

From State Appropriations for 1884.

$280.00, fence, Buildings and Grounds.
$300.00, Botanical Laboratory, Buildings and Grounds.
$400.00, plumbing in Chemical Lab., Buildings and Grounds.
$100.00, binding books and periodicals, Library.
$ 75.00, cataloguing, Library.

From Current Appropriations.

$75.00, drawing models.
$30.00, repairs of engineering instruments.
$42.00, desks and tracing linen for Architectural Department.

Prof. Shattuck was allowed $300 per annum for services as Business Agent.

The following report of Mr. Earle was received and accepted:

Your committee, to whom was referred the matter of making an exhibit of University products at the World's Exposition at New Orleans, will report as follows:

We favor the making of as complete an exhibit as is practicable of the products of the farm and the shops, etc., of the University, at New Orleans, as a part of the State exhibit from Illinois, providing the expenses of making this exhibit can be met by the State Exposition Commissioner.

PARKER EARLE,
S. H. PEABODY.

Mr. Earle and the Regent were appointed a committee to make arrangements for an exhibit at New Orleans, provided no expense to the University be incurred.

Authority was given to the Regent to remove water closets from Chemical building.

The question of employing a Music Teacher was referred to the Regent and Executive Committee, with power to act.

The following report from Farm Committee was received, and its recommendations adopted:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The committee to whom was referred the proposition to remove the small wooden building south of the Greenhouse to a place near the North barn, report that it has considered the subject, and that the change is not desirable.

Respectfully submitted,

J. T. PEARMAN,
PARKER EARLE,
CHAS. BENNETT,
Committee.

URBANA, June 11, 1884.

The matter of purchase of certain lands belonging to Mr. C. Rush was referred to the Executive Committee, with instructions to investigate and report to this Board at the next meeting.

Adjourned to 8 o'clock P. M.

EVENING SESSION.

The Board met on time.

Present—Trustees Bennett, Earle, Follansbee, McLean, Millard and Pearman.

On motion of Trustee Bennett, it was ordered that the receipts and expenditures of the Griggs Farm be henceforward kept in a separate account.

Leave of absence for the vacation was granted to Professors Ricker, Roos and Snyder.

The President made the following report from Committee on Kankakee bonds:

To the Board of Trustees of the Illinois Industrial University:

Your committee, to whom was referred the matter of the Kankakee county bonds, would respectfully report:

That a proposition is made by Kankakee county through Hon. D. C. Taylor, its agent, to pay the bonds of said county now held by this University, by giving to the University $48,000 in 5 per cent. 20 year refunded bonds, of said county, and $3,000 in cash, which amount is the full amount of the principal and accrued interest due on said bond at this date.

And, whereas, there have arisen grave doubts as to the validity of said Kankakee county bonds now held by this University, therefore your committee would respectfully recommend that such proposition be accepted.

S. M. MILLARD,
CHAS. BENNETT,
G. A. FOLLANSBEE,
Committee.

The report was received.

The following resolution was offered by Trustee Follansbee, and was adopted:

Resolved, That the report of the committee to whom was referred the matter of refunding the Kankakee county bonds be adopted, and that the Treasurer of this Board be authorized to surrender to the authorities of said county the bonds of said Kankakee county now held by him on behalf of the University, upon receipt by him of $18,000 in bonds of said county running twenty years with interest at the rate of 5 per cent. per annum and the sum of three thousand dollars in money.

Resolved, further, That prior to the surrender of said bonds aforesaid the Executive Committee and G. A. Follansbee shall secure the opinion of competent legal counsel, at the expense of said Kankakee county, as to the legality and regularity of the issue of said new bonds so to be given by said county in lieu of said bonds as aforesaid.

Resolved, further, That these resolutions shall be invalid unless said settlement is made within 60 days from this date.

The Auditing Committee made the following report, which was read and approved:

CHAMPAIGN, ILL., June 11, 1884.

To the Board of Trustees of the Illinois Industrial University:

Your committee respectfully report that they have examined vouchers of business agent Nos. 401 to 550 inclusive, and find them all in proper form and duly receipted, except No. 445, for which money has been forwarded but receipt not yet received. We have also examined report of J. W. Bunn, Treasurer, and recommend that the same be approved.

CHAS. BENNETT,
ALEX. McLEAN,
Auditing Committee.

On motion of Trustee Bennett, an amount of $325 was appropriated for advertising, to be expended under the direction of the Regent.

Adjourned.

S. M. MILLARD,
President.

E. SNYDER,
Secretary.

BOARD MEETING—SEPTEMBER, 1884.

The Board met in the University parlor Tuesday, September 11, 1884, at 3 o'clock P. M.

No quorum being present the Board adjourned to meet at the Grand Pacific Hotel, Chicago, Ill., on Wednesday, September 12, 1884, at 8 o'clock P. M.

SECOND DAY'S SESSION.

The Board met at the Grand Pacific Hotel, Chicago, Ill., Wednesday, September 12, 1884, at 8:30 P. M.

Present—Trustees Earle, Bennett, Cobb, McLean, Millard and Paden.

Absent—Governor Hamilton; Trustees Landrigan, Follansbee, Pearman and Postel.

The minutes of the last meeting were read and approved.

On motion, the reports of the Regent and other officers were deferred, and the reports of committee taken up.

Trustee Bennett, from Committee on Sale of Nebraska Lands, made the following report:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—Your committee for the sale of lands in Nebraska report their transactions for the last three months as follows:

Contracts for sales have been completed with:

No.	Date.	Buyer.	Tract.	Acres.	Rate	Price.	Cash
5	May 31	S. D. Miller } W. C. Bashor }	N. W. 31 3-8	153 33	$15 00	$2,300 00	$575
6	June 2	T. A. Woodward	S. W. 12 3-8	160	12 50	2,000 00	500
7	" 3	Aug Zahlten	S. W. 24 3-8	160	12 50	2,000 00	500
8	" 25	C. E. Baker	S. W. 15 3-8	160	14 00	2,240 00	560
9	July 25	C. M. Dawson	S. W. 35 3-7	160	15 00	2,400 00	600
10	" 25	J. M. Herbert	S. E. 34 3-7	160	15 00	2,400 00	600
11	" 29	D. Richardson	N. W. 24 3-8	160	12 50	2,000 00	500
12	" 29	H. C. Kludas	S. E. 24 3-8	160	12 50	2,000 00	500
				1,273.33		$17,340 00	$4,335

Propositions have been accepted for the following:

13	Aug.	15	H. J. Willis } A. W. Mills }	N. W.	27	3-8	160	$12 50	$2,000 00	
14	Sept.	5	N. L. Collins	N. E.	31	3-8	160	12 50	2,000 00	
15	"	5	N. T. Maxwell	S. W.	31	3-8	153.11	15 00	2,296 65	
16	"	5	R. L. Gumaer	N. W.	10	2-8	160	12 50	2,000 00	
17	"	5	R. L. Gumaer	N. W.	11	2-8	160	10 00	1,600 00	
18	"	5	C. C. Bryant	S. E.	2	2-8	160	10 00	1,600 00	
							953.11		$11,496 65	

The total sales thus far have been:

Previously reported	620 25	$9,449 84	
Completed sales, this quarter	1,273.33	17,340 60	
Proposals accepted, this quarter	953 11	11,496 65	
	2,846.69	$38,286 49	

Agreeably to instructions from the Executive Committee, your committee has had the subject of trespassers on these lands investigated by Mr. C. E. Baker, our correspondent at Beatrice, whose report is herewith submitted. Your committee respectfully ask further instructions upon this point.

No payment has yet been made to Mr. Baker for his services to this committee in connection with the sales of these lands. We recommend that the following sums be allowed and paid to him:

For services to committee on land sales to Sept. 1st	$65 66
Per diem and expenses, visiting trespassers	17 00
Total	$82 66

All of which is respectfully submitted,

CHAS. BENNETT,
S. H. PEABODY,
Committee.

URBANA, Sept. 9, 1884.

The report was received and placed on file. The sum of $82.66, expenses accrued on land sales, was audited, and a warrant for same ordered to be drawn.

The Executive Committee made the following report:

To the Board of Trustees of the Ill. Ind. University:

The undersigned, your Executive Committee, beg leave to report that at a meeting of your committee since the last June meeting, the question of advertising for the University was taken under consideration, and your committee decided it was advisable and important that the appropriation for advertising be increased to $600. The importance of this increase seemed so necessary that the committee found it necessary to act promptly, as the work must of necessity be done prior to this meeting.

Your committee therefor ask that this report and the action of the Executive Committee be approved.

S. M. MILLARD,
CHAS. BENNETT,
Committee.

The report was received, and the increased amount appropriated, as asked for.

The Executive Committee asked for further time to report on purchase of Rush lot. Granted.

The Executive Committee submitted the following report:

To the Board of Trustees of the Ill. Ind. University:

GENTLEMEN—The undersigned, your committee, to whom was referred the matter of refunding the Kankakee county bonds, beg leave to report that they have procured the opinion of Hon. John B. Hawley, of Chicago, as to the validity of said new bonds offered in exchange, and find from said opinion that the refunding bonds are regularly and legally issued, which opinion is herewith presented;

Upon compliance with the condition of the resolutions passed by this Board, June 11th, last, your committee reported that fact to Hon. John W. Bunn, Treasurer of the Board, with instruction to make the exchange proposed.

Your committee herewith present a statement from said Treasurer notifying your committee of the transfer and exchange.

Respectfully submitted,

S. M. MILLARD,
CHAS. BENNETT,
Committee.

The report was received and approved.

The Regent presented the following report:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The vacation now closing has been devoted to efforts for making the University more widely known that its advantages might be more generally sought by those for whom they are designed. Circulars have been prepared to alumni and undergraduates, to county superintendents and to the public generally. The latter have been distributed in large numbers chiefly through the courtesy of our friends. Advertisements have been inserted in the leading secular, agricultural and religious papers of the State.

An unsolicited and unpaid article, commendatory of the University and its work, occupying more than two pages, and handsomely illustrated, appeared in the Prairie Farmer, and a large number of copies in addition to the regular edition was distributed. The constant and kindly recognition which the press of the State is giving to our work is a healthy indication of the improved relations growing between the University and the people of Illinois. Catalogues have been distributed freely, and the inquiry for information has been constant and earnest. The National Educational Association convened at Madison, Wisconsin, July 16th. A most notable feature at this gathering was a display of the results of industrial education, in the products of drawing rooms, workshops, etc. Our engineering college was represented by series of elementary shop work from the machine and carpenter shops, numerous examples of drawing from all the schools, and several elaborate models of bridges. The exhibit of this University was in all respects a creditable part of the general display, while in its drawings, bridge models and wood work it found no superior.

At the request of the managers of the Winnebago County Agricultural Society a part of the same material was taken to Rockford, at the late county fair. It was kindly received and elicited much comment and inquiry.

Arrangements for representing the University in the State exhibit at the coming World's Industrial and Cotton Exposition at New Orleans, to open in December next, are progressing. The Governor has been pleased to appoint as special commissioners, Prof. Burrill for Forestry, Prof. Morrow for Agricultural Products, Prof. McMurtrie for Chemical Analysis, and the Regent for Industrial Education. In these departments, and in perhaps some others, the University will be a place for gathering and arranging exhibits, whence they will be forwarded to New Orleans. The University itself will make a full display in all its technical departments.

IMPROVEMENTS.

The improvements authorized at the June meeting are mostly completed. The fence on the north side of Green street is finished, having cost $183.30. The expenditure authorized was $500.

The cases for Prof. Burrill's room have been built, the room below finished, and connection made thereto by a stairway. The expense has been $307.35; your appropriation was $300; this sum has been exceeded, because it was found desirable to plaster the room, which was not included in the original estimate.

The repairs in the Chemical Laboratory are well under way, but are not yet complete, and can not be reported upon.

PROTECTION AGAINST FIRE.

This subject, which has interested all concerned for some time, has received careful consideration, and I am prepared to make the following recommendations:

It is beyond question that the small high pressure boiler, which has been used for pump service, is too much worn to be safe for another season's work. It has been carried

along from year to year, for reasons of economy, for the last three years, until now the same economical consideration demands a new boiler. It is proposed to continue the use of the present pump, as a feed-pump, forcing hot water to the heating boilers, and to procure another pump for raising water to the tanks in the upper part of the buildings, and for service in case of fire. After correspondence with the leading pump-makers and examination of their work, I recommend for our use the Worthington Duplex Pump, having two alternative steam-and-water-pistons, which by their reciprocal action maintain an equable flow of water in the lead-pipe.

The pipe from the pump as now placed leads to the upper floor, and feeds either tank at pleasure. I would extend this pipe upward through the roof, and above the roof would make a branch to the eastward and one to the westward, using in all about 160 feet of horizontal pipe, with proper hose couplings at each end and at the middle. I would attach to each end a suitable length of flexible hose, to be kept constantly in a proper box for protection against the weather, and to be always ready for use. In the same box I would also have kept a fire ax and saw.

To this stand-pipe attachments for hose are already made on each floor, and one should be put in the attic under the roof.

It will be possible with these means, if a fire should break out, to fight with some success until aid could reach us from without.

Our building is very high, and our roof is its most vulnerable part. I would recommend that a wrought iron stand-pipe be placed upon the outer wall in the court yard, of calibre and fittings suited to the steam-fire engine of the adjacent cities. This pipe should have hose fittings at each floor, and should extend above the roof. The balconies in the court would make a ladder attachment for the lower half unnecessary. For the upper half a simple iron ladder should be attached. From inquiries which I have made I find that the cost of such a pipe will be but moderate.

A similar pipe could be attached to the Chemical building with its ladder for fire-escape.

I report the appointment of Miss Kittie Baker as Instructor in Music, under authority given to Dr. Pearman and the Regent,—she to receive $150 per annum, and the fees derived from the students in music.

Prof. Wetzel has resigned his appointment as Professor of Elocution.

I communicate to you an interesting report from Prof. Burrill upon the experiment on feeding of silk worms. It furnishes an important addition to our knowledge upon this subject, and the experiments should be continued.

I also ask consideration of his report on the Horticultural Department with such action as the case may seem to require.

His request for $25 from the State appropriation for Cabinets, for labor upon the collections of Insects and Plants, is concurred in.

Also his request for $15 as Corresponding Secretary.

Prof. Morrow's quarterly farm report is herewith submitted. Attention is asked to a special report on the fences of the Griggs Farm, which needs consideration and action.

I ask the assignment of $150—from the State appropriation for Laboratories—for the purchase of a Chronometer for the Physical Laboratory.

Also of $25 from same fund for apparatus for gas analysis in the Chemical Laboratory.

Respectfully submitted,

[Signed] S. H. PEABODY,

Regent.

The question of purchase of a new boiler and pump was referred to the Committee on Buildings and Grounds, for report at this meeting.

Prof. Burrill's report on Silkworm Experiment was received and ordered to be printed. (See page 85.)

Prof. Burrill's request for adjusting the accounts of the Horticultural Department was deferred until next meeting.

$25.00 was appropriated for Botanical Collections.

Prof. Morrow's request for additional stabling was referred to the Executive Committee, Farm Committee and the Regent, with power to act.

The matter of adjustment of division fence on the Griggs Farm was referred to the Farm Committee and the Regent, with power to act.

Adjourned to Thursday, September 13, 1884, 9 o'clock A. M.

THIRD DAY'S SESSION.

The Board was called to order by the President at 9:45 A. M.

Present: Trustees Bennett, Earle, McLean, Millard and Paden.

Trustee McLean, from Committee on Buildings and Grounds, made the following report:

CHICAGO, September 11, 1884.

To the President and Members of the Board of Trustees Illinois Industrial University:

The undersigned would respectfully report that we have examined the recommendation of Regent Peabody relative to obtaining new pump and boiler, together with the matter of piping the roof of main building to be used for fire purposes, and find that the plan is feasible and would doubtless be of great benefit in case of fire.

We therefore recommend that an appropriation from current fund account be made, not to exceed $850, for the purpose of obtaining the pump, boiler and necessary piping as set forth in said report.

We would also recommend that a sufficient space be enclosed at landing in the attic of main building, with suitable doors, for easy access to said attic, with keys for same to be kept in a proper place so as to be easily obtained in case of fire; also that all the woodwork in same be painted with fire-proof paint.

And further, report that the foregoing matters be referred to Executive Committee and Regent for completion, and to report at next meeting of the Board.

We would further recommend that the Executive Committee obtain one gross of fire hand-grenades, the same to be distributed throughout the building in the most available and useful places for immediate use in case of fire.

Respectfully submitted,

ALEX. McLEAN,

PARKER EARLE,

Committee.

The report was received and approved. A sum not to exceed $850 was appropriated for the purpose.

Treasurer J. W. Bunn presented his report.

ILLINOIS INDUSTRIAL UNIVERSITY,

To JOHN W. BUNN, TREASURER, *Dr.*

1884.					
Aug. 31	To amount paid on account	Board expense	$95 98		
	" " "	Salaries	3,700 18		
	" " "	Buildings and grounds	51 33		
	" " "	Fuel and lights	1,432 24		
	" " "	Stationery and printing	1,222 60		
	" " "	Mechanical department	314 54		
	" " "	Architectural "	886 33		
	" " "	Agricultural "	1,845 66		
	" " "	Horticultural "	823 32		
	" " "	Chemical "	110 60		
	" " "	Military "	17 54		
	" " "	Library and apparatus	16 26		
	" " "	Incidental expense	122 89		
					$10,639 44
	" " "	Preliminary year			50 00
	" " "	Physical laboratory	$2 30		
	" " "	Cabinets	73		
	" " "	Silk-worm experiments	54 88		
	" " "	Bee experiments	9 90		
	" " "	Nebraska lands	25 30		
	" " "	Elocution	92 50		
	" " "	Madison Exposition	76 19		
	" " "	Architectural desks	34 74		
					296 54
	State appropriations—				
	To amount paid on account	Taxes on lands	$2,542 03		
	" " "	Buildings and grounds	1,410 36		
	" " "	Laboratories	225 68		
	" " "	Mech. and Arch. shops	548 22		
	" " "	Books and publications	303 68		
	" " "	Cabinets	46 50		
	" " "	Current expense of instruction	3,999 88		
	" " "	Blacksmith shop	165 34		
					9,241 69
	Balance				24,954 28
					$45,181 95

URBANA, Sept. 10, 1884. JOHN W. BUNN, *Treasurer.*

ILLINOIS INDUSTRIAL UNIVERSITY.

To JOHN W. BUNN, TREASURER, *Cr.*

1884.				
June 10	By balance			$112 97
	" interest on Menard county bonds			350 00
15	" " " Morgan county bonds			1,750 00
July 1	" " " Champaign county bonds	$6,300 00		
	" " " Pike county bonds	2,100 00		
	" " " Sangamon county bonds	880 00		
	" " " Kankakee school bonds	300 00		
	" " " Chicago water bonds	875 00		
				10,455 00
	By am't rec'd from State for taxes on lands in Nebraska and Minnesota	$2,500 00		
	" " " " repairs and improvements	3,000 00		
	" " " " expenses of laboratories	1,500 00		
	" " " " educational work	1,500 00		
	" " " " library and museum	1,500 00		
	" " " " specimens for cabinets	1,000 00		
	" " " " expenses of instruction	14,000 00		
				25,000 00
Aug. 20	By interest on Kankakee county bonds			3,000 00
30	By am't rec'd on acc't buildings and grounds	$29 55		
	" " " Fuel and lights	4 40		
	" " " Stationery and printing	150 00		
	" " " Mechanical department	280 52		
	" " " Architectural department	956 42		
	" " " Agricultural department	1,475 54		
	" " " Horticultural department	613 48		
	" " " Chemical department	89 17		
	" " " Incidentals	7 70		
	" " " Physical laboratory	40		
	" " " I. C. R. R. donations	906 80		
				4,513 98
				$45,181 95

URBANA, Sept. 10, 1884. JOHN W. BUNN, *Treasurer.*

To the Board of Trustees of the Illinois Industrial University:

I have exchanged with Kankakee county 30 Kankakee county bonds of $1,000 each, $30,000; for 30 Kankakee county 5 per cent. refunded bonds, $1,000, $30,000, registered by the Auditor of State, due in 20 years from July 1, 1884.

I also received on account of interest 18 Kankakee county 5 per cent. refunded bonds, $18,000; cash $3,000. In accordance of your resolutions adopted June 13, 1884.

JOHN W. BUNN, *Treasurer.*

SPRINGFIELD, August 20, 1884.

The report was received and referred to the Auditing Committee.

The Business Agent then submitted the following report:

Current Appropriations.

March 14, 1884.	Appropria'd	Receipts also appropriat'd	Expended.	Balance.
Board expense	$300 00		$181 94	$118 06
State			5,000 28	
Salaries	16,590 00		10,850 07	730 65
Buildings and grounds	100 00	$78 05	141 02	37 03
Fuel and lights	1,000 00	64 73	1,855 30	
Stationery and printing	1,425 00	150 00	1,375 70	199 30
Mechanical Department		296 02	486 77	
Architectural Department	452 56	1,064 80	971 13	546 23
Agricultural Department	1,959 91	3,109 54	2,411 12	2,658 33
Horticultural Department	11 61	1,050 67	1,088 04	
Chemical Department	99 99	433 48	153 70	379 77
Military Department	50 00		54 36	
Library and apparatus	155 00		18 89	136 11
Incidental expense	200 00	7 70	166 00	41 70
Sundries.				
Physical laboratory	37 70	40	2 30	35 80
Cabinets	8 85		73	8 12
Gymnasium	81 75			81 75
Examination of schools	19 20		24 89	
Illini type	75 00		75 00	
Silkworm experiment	100 00		64 88	35 12
Bee experiment	10 00		9 90	10
Nebraska lands	84 10	542 67	119 30	497 47
Elocution	180 00	132 50	312 50	
Exposition at Madison	100 00		76 19	23 81
Prof. Ricker's desks	42 00		34 74	7 26
Preparatory Department, fees		320 00	500 00	
University fees		2,887 50		
Illinois Central freight		906 80		

State Appropriations.

From July 1, 1883.	Appropriated.	Received.	Expended	Balance.
Taxes on lands, ½ per annum	$5,000 00	$4,969 06	$4,969 06	
Buildings and grounds, ½ per annum	6,000 00	6,000 00	4,410 36	$1,589 64
Laboratories, ½ per annum	3,000 00	3,000 00	1,467 68	1,532 32
Mech. and Arch. shops, ½ per annum	3,000 00	3,000 00	1,600 00	1,400 00
Books and publications, ½ per annum	3,000 00	3,000 00	1,352 42	1,647 58
Cabinets, ½ per annum	2,000 00	2,000 00	201 47	1,798 53
Current expenses of inst., ½ per annum	28,000 00	28,000 00	17,999 88	10,000 12
Blacksmith shop	2,500 00	2,500 00	2,462 09	37 91
Machines and tools	2,000 00	2,000 00	1,764 03	235 97
Total balance	$54,500 00	$54,469 06	$36,226 99	$18,242 07

Trustee Earle offered the following resolution:

Resolved, That the President of the Board of Trustees, the Regent, and the Treasurer, be and are hereby appointed a Committee on Department Accounts, and that they report to this Board at the December meeting a system of accounts relating to said several departments in the University.

Passed.

It was voted that the employment of a teacher of elocution be postponed until the December meeting.

The following resolution was offered by Trustee Earle, and was passed:

WHEREAS, The Regent of the University, and Professors Morrow, Burrill and McMurtrie have been appointed special commissioners from this State for organizing certain exhibits for the World's Industrial Exposition at New Orleans, and

WHEREAS, These exhibits will not only contribute to the usefulness of the Exposition and will be an essential part of the general exhibit to be made by the State of Illinois, but will be of especial advantage to the University in advertising its practical and scientific character to the world at large, therefore

Resolved, That leave of absence be granted to these gentlemen not exceeding one month each to attend the World's Exposition and attend to the arrangement of their several exhibits; the periods and times of these absences to be arranged by the Regent so as to embarrass as little as possible the working of their several departments.

The following report from Trustee Millard, from Committee on Lands in Minnesota, was received and ordered put on file:

To the Board of Trustees of the Illinois Industrial University:

GENTLEMEN—The undersigned, your Executive Committee, respectfully report that they have investigated the condition and value of lands owned by the University in Kandiyohi, Renville and Pope counties in the State of Minnesota, and from all the information your committee have been able to obtain by means of correspondence they are of the opinion that said lands have not reached a value which warrants the Board in offering them for sale. The Nebraska lands have ripened into a market value much faster than the Minnesota lands, owing to the more rapid settlement of Nebraska. The Minnesota lands are gradually improving. Their location is not as favorable as they would be if the R. R. was nearer. Nevertheless it is a question of time, only, when they will bring ten dollars and upwards an acre, and until that time comes your committee recommend that no expense be incurred in surveying or advertising such lands.

The correspondence with the chairman of your committee is herewith submitted for the better information of the Board, being three letters from G. H. Perkins, of Wilmar, Minnesota.

S. M. WILLARD,
CHAS. BENNETT.
Executive Committee.

THE CENTRAL LAND CO.,

WILLMAR, MINN., July 23, 1884.

S. M. MILLARD, ESQ.,

DEAR SIR: Your esteemed favor of 21st inst. is before me, and I am very glad to renew our correspondence. Though I am not able to make you any flattering promises of large sales of your lands in the immediate future, nevertheless my sales have been very satisfactory this season. As you will see by the above, I am now connected with a stock company, and will say that my facilities for advertising and selling lands have been greatly improved by the change. If you will send me a list of your lands in this part of the State, with your prices and terms of sale, I am confident that I can close out at least a few tracts to good advantage within coming year. With kind regards, I am

Yours very truly,

GEO. H. PERKINS,
Secretary.

WILLMAR, MINN., July 31, 1884.

S. M. MILLARD, ESQ.,

DEAR SIR: Replying to your favor of the 25th inst., in my opinion the Illinois Industrial University lands in this county will sell for from $5 to $10 per acre on the terms you mention, and might bring a better price next year. If they are to be offered for sale during Spring of 1885, it would be a wise plan for you to come about Sept 1st, and look them over and fix values on them. Can spend the time to go with you after that time but not before, and then you would have ample time to make your report and have it acted upon by your Board before next Spring opens. Catalogue received. Thanks. Hoping to see you here soon, I am

Yours very truly,

GEO. H. PERKINS,
Secretary.

WILLMAR, MINN., Aug. 6, 1884.

S. M. MILLARD, ESQ.,

DEAR SIR: In reply to your favor of 4th inst., I am of the opinion that only a small part of the lands of Illinois Industrial University, in this and Pope counties, could be sold for $10 per acre within next three years. Could probably be made to average $7 per acre by selling partly on long time with low rate of interest. They are situated so far from railroad that there is no very great demand for them as yet, for the reason that there are still plenty of unoccupied lands nearer markets.

Yours respectfully,

GEO. H. PERKINS,
Secretary.

A report from Trustee Bennett, on Nebraska lands, was received, and referred to the Executive Committee with power to act.

The following appropriations of current funds were voted, for the six months ending February 28, 1885:

Current Appropriations for six months ending February 29, 1885.

Board expense		$300 00
Salaries		17,360 00
Buildings and grounds	$50 00	
Fuel and lights	1,500 00	
Stationery and printing	400 00	
Military Department	50 00	
Library and apparatus	150 00	
Incidental expenses	200 00	
		2,350 00
Sundries—		
Griggs farm	$100 00	
Physical Laboratory	35 80	
Cabinets	8 12	
Gymnasium	81 75	
Nebraska lands	100 00	
Desks—Architectural Department	7 26	
Boiler, pump and fire grenades	850 00	
Engraving, proof reading of reports	65 00	
		1,247 93
Mechanical Department	$500 00	
Architectural "	546 23	
Agricultural "	658 33	
Horticultural "	500 00	
Chemical "	379 77	
		2,584 33
		$23,842 26

Trustee Paden, from Auditing Committee, submitted the following report:

To the Honorable Board of Trustees of the Illinois Industrial University:

Your committee to whom was referred the Business Agent's statement, would respectfully report—

1st—That they have examined the vouchers from No. 551 to 755, both inclusive, and find them correct, also No. 548 not received at last meeting.

2d—That they have examined the Treasurer's report, and recommend that it be received and filed; and,

3d—That they recommend the adoption of the appropriations from current funds for six months closing February 28, 1885, as submitted.

R. N. PADEN,
CHAS. BENNETT,
Auditing Committee.

The report was received and approved.

The following amounts from State appropriations were allowed to be expended:

$25 for Chemical Laboratory.

$150 for Physical Laboratory.

Dr. Peabody, Trustees Millard, Cobb, Follansbee, Bennett, McLean, and Treasurer Bunn were appointed a Committee on Legislation, and requested to report to the Board from time to time as they may deem necessary.

Adjourned.

S. M. Millard,
President.

E. Snyder,
Secretary.

List of Bills for which Warrants have been drawn.

No.	Date.	To whom.	For what.	Amount.
	1882.			
1	Sept 15	R. B. Mason	Expenses to Board meeting	$4 00
2	" 15	R. N. Paden	" " "	14 00
3	" 15	Chas. Bennett	" " "	5 78
4	" 15	Alex. McLean	" " "	19 69
5	" 15	Emory Cobb	" " "	1 50
6	" 15	R. S. Wilber	Hauling	98 50
7	" 15	Ind. Journal	Advertising	9 60
8	" 15	Tribune Co	"	16 64
9	" 15	C. F. Conover	Work	28 00
10	" 15	Colegrove Book Co	Books	4 85
11	" 15	S. H. Peabody	Traveling expenses	255 62
12	" 15	S. W. Stratton	Printing	10 12
13	" 15	Amer. Phil. Asse	12 vols. reports	12 00
14	" 15	Walker & Mullekin	Frame	4 55
15	" 15	Larrabee & North	Tools	229 90
16	" 15	Trevett Bros	Hardware	3 19
17	" 15	S. H. Peabody	Salary September, 1882	250 00
18	" 30	T. J. Burrill	" "	150 00
19	" 30	S. W. Shattuck	" "	150 00
20	" 30	E. Snyder	" "	150 00
21	" 30	J. C. Pickard	" "	150 00
22	" 30	N. C. Bicker	" "	150 00
23	" 30	J. D. Crawford	" "	150 00
24	" 30	G. E. Morrow	" "	150 00
25	" 30	F. W. Prentice	" "	150 00
26	" 30	P. Roos	" "	100 00
27	" 30	I. O. Baker	" "	125 00
28	" 30	B. C. Jillson	" "	166 66
29	" 30	Wm. McMurtrie	" "	166 66
30	" 30	C. H. Peabody	" "	90 00
31	" 30	E. A. Kimball	" "	125 00
32	" 30	N. S. Spencer	" "	80 34
33	" [illegible]	[illegible]	" "	15 00
34	" 30	C. W. Rolfe	" "	98 00
35	" 30	H. Slauson	" "	40 00
36	" 30	A. B. Baker	" "	50 00
37	" 30	Agricultural Department	Farm expense	437 27
38	Oct. 16	Grace Peabody	Salary	13 25
39	" [illegible]	[illegible]	[illegible]	5 00
40	" 16	U. S. Patent Office	Binding	15 00
41	" 16	Larrabee & North	Hardware	9 45
42	" 16	Farmers Review Co	Advertising	9 00
43	" 16	Champaign Gas Co	Lights to October 1	40 20
44	" 16	Adolph Stum	Veneering	17 44
45	" 16	Central Telephone Co	Rent of instrument	15 00
46	" 16	Fuller & Fuller	Chemicals	191 65
47	" 16	L. B. & W. Railroad	Freights	7 82
48	" 16	Zell & Schwabacher	1 barrel of alcohol	25 75
49	" 16	E. A. Kimball	Expenses to Chicago	7 67
50	" 16	Fuller & Fuller	Glass	13 78
51	" 16	Anton Iten	8 days' work	12 00
52	" 16	G. W. Parker	Work in shops	64 26
53	" 16	John Stewart	3½ days' teaming	10 50
54	" 16	Randolf Birkholz	Painting	45 50
55	" 16	W. T. Pratt	"	42 00
56	" 16	S. W. Shattuck	Students' pay-roll	195 06
57	" 31	S. H. Peabody	Salary October, 1882	250 00
58	" 31	T. J. Burrill	" "	150 00
59	" 31	S. W. Shattuck	" "	150 00
60	" 31	E. Snyder	" "	150 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1882.			
61	Oct. 31	J. C. Pickard	Salary October, 1882	$150 00
62	" 31	N. C. Ricker	" "	150 00
63	" 31	J. D. Crawford	" "	150 00
64	" 31	G. E. Morrow	" "	150 00
65	" 31	F. W. Prentice	" "	150 00
66	" 31	P. Roos	" "	100 00
67	" 31	I. O. Baker	" "	125 00
68	" 31	Wm. McMurtrie	" "	166 66
69	" 31	B. C. Jillson	" "	166 66
70	" 31	C. H. Peabody	" "	90 00
71	" 31	E. A. Kimball	" "	125 00
72	" 31	N. S. Spencer	" "	80 00
73	" 31	J. Sondericker	" "	75 00
74	" 31	C. W. Rolfe	" "	90 00
75	" 31	H. Slauson	" "	40 00
76	" 31	E. P. Morse	" "	100 00
77	" 31	A. B. Baker	" "	50 00
78	Nov. 15	S. W. Shattuck	Students' pay-roll October, 1882	194 00
79	" 15	Grace Peabody	Salary, October, 1882	15 00
80	" 15	A. J. Stoneburner	" " "	30 00
81	" 15	Fuller & Fuller	Chemicals	24 71
82	" 15	Eimer & Amend	Apparatus and chemicals	396 94
83	" 15	Library Bureau	Charts	4 00
84	" 15	Brown & Co	Books	5 50
85	" 15	F. W. Christern	"	4 75
86	" 15	Rudolph Birkholz	Painting	44 63
87	" 15	G. W. Parker	Work in shops	58 50
88	" 15	W. T. Pratt	Repairing roofs	30 00
89	" 15	Fairbanks, Morse & Co	Dynamometer	29 70
90	" 15	Eichberg Bros	9 yards duck	3 15
91	" 15	Larrabee & North	Hardware	34 85
92	" 15	Illinois State Register	Advertising	7 50
93	" 15	Springfield Journal Co	"	8 00
94	" 15	Champaign Gazette	Binding	135 75
95	" 15	Agricultural Department	Farm expense, October, 1882	658 06
96	" 29	S. H. Peabody	Salary, November, 1882	250 00
97	" 29	T. J. Burrill	" "	150 00
98	" 29	S. W. Shattuck	" "	150 00
99	" 29	E. Snyder	" "	150 00
100	" 29	J. C. Pickard	" "	150 00
101	" 29	N. C. Ricker	" "	150 00
102	" 29	J. D. Crawford	" "	150 00
103	" 29	G. E. Morrow	" "	150 00
104	" 29	F. W. Prentice	" "	150 00
105	" 29	P. Roos	" "	100 00
106	" 29	I. O. Baker	" "	125 00
107	" 29	Wm. McMurtrie	" "	166 66
108	" 29	B. C. Jillson	" "	166 66
109	" 29	C. H. Peabody	" "	90 00
110	" 29	E. A. Kimball	" "	125 00
111	" 29	N. S. Spencer	" "	80 00
112	" 29	J. Sondericker	" "	75 00
113	" 29	C. W. Rolfe	" "	90 00
114	" 29	H. Slauson	" "	40 00
115	" 29	E. P. Morse	" "	100 00
116	" 29	A. B. Baker	" "	50 00
117	" 29	C. C. Harris	Forging	2 50
118	" 29	T. J. Burrill	Salary Corresponding Sec'y, 3 mos	50 00
119	" 29	S. W. Shattuck	" Business Agent, 3 mos	75 00
120	" 29	E. Snyder	" Recording Secretary, 3 mos	50 00
121	" 29	G. E. Morrow	" Farm Superintendent, 6 mos	100 00
122	" 29	A. J. Stoneburner	" Fireman, November, 1882	31 00
123	" 29	Grace Peabody	" Regent's clerk, November, 1882	13 38
124	" 29	Lee Clutter	Teaming	2 00
125	" 29	Agricultural Department	Farm expense, November, 1882	581 72
126	" 29	" "	Work for other departments	90 50
127	" 29	I. O. Baker	Petty expense	4 20
128	" 29	Clark Rush	Work in Architectural shops	25 60
129	" 29	R. Abernathy	Lettering and painting	27 00
130	" 29	O. Myers	Work on grounds	3 10
131	" 29	Dietrich Raub	7½ days work on grounds	10 35
132	" 29	F. A. Taft	Work in Bot. Laboratory	1 70
133	" 29	L. V. Manspeaker	Seeds	4 50
134	" 29	G. W. Parker	Work in Architectural shops	59 85
135	" 29	Rudolf Birkholz	Painting	12 25
136	" 29	W. T. Pratt	Roof repair and work	62 90
137	" 29	John Stewart	12 days teaming	33 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1882.			
138	Nov. 29	C. C. Harris	Forging	$3 00
139	" 29	W. H. Stoneburner	5½ days work on road	7 59
140	" 29	Anton Iten	6½ days work on road	9 37
141	" 29	L. G. Bronson	5 days teaming on road	13 75
142	" 29	L. B. & W. Ry	Freights	6 08
143	" 29	I. C. R. R.	Advanced freight	3 25
144	" 29	T. J. Burrill	Petty expenses	18 50
145	" 29	H. Swannell	Paints, oil and chemicals	77 14
146	" 29	Trevett & Green	Hardware	14 06
147	" 29	" "	Plumbing, etc	82 15
148	" 29	Crane Bro's M'f'g Co	Pipes and fittings	139 01
149	" 29	" " " "	Radiator screws	6 00
150	" 29	Henry Horn	2 cars coal	60 00
151	" 29	Horticultural Department	Labor on grounds	64 94
152	" 29	G. P. Marvin	Advertising	12 00
153	" 29	Peterson & Lloyde	Stationery	4 00
154	" 29	H. A. Ward	Minerals	5 00
155	" 29	Champaign Co. Gazette	Printing	22 50
156	" 29	Sam Dallenbach	Clock	3 00
157	" 29	Cole Grove Book Co	Books	2 25
158	" 29	M. E. Lapham	Lumber	148 48
159	" 29	American Chem. Journal	Subscription	6 00
160	" 29	Trevett & Green	Tools	4 15
161	" 29	Wm. Price	Putty and varnish	10 03
162	" 29	C. & U. Gas Co	Gas, October, 1882	61 80
163	" 29	Elmer & Amend	Apparatus	28 80
164	" 29	Nebraska State Journal	Advertising	14 00
165	" 29	Trevett & Green	Hardware	67 85
166	" 29	E. N. McAllister	Postage, three months	27 00
167	" 29	Mrs. A. Wilkinson	Fees and leading choir	100 00
168	" 29	Mechanical Department	Work for other departments	64 91
169	" 29	" "	Work and materials for other depts	1:9 70
170	" 29	Architectural Department	Work for other departments	277 00
171	" 29	" "	Work and materials for other depts	347 50
172	" 29	S. W. Shattuck	Petty expenses, 3 months	73 23
173	" 29	" " "	Students' labor pay-roll	214 08
174	" 29	Alex. McLean	Expenses to meetings	40 05
175	" 29	R. B Mason	" "	6 75
176	" 29	S. M. Willard	" "	20 00
177	Dec. 15	Chas. Bennett	" "	9 36
178	" 15	G. F. Kenower	" "	12 10
179	" 15	Wm. Heffernan	Teaming	4 50
180	" 15	Sutton & Sheldon	Tile	1 68
181	" 15	H Bronson	Brooms	3 50
182	" 15	W. B. Brancher	Salary as band leader	15 00
183	" 30	S. H. Peabody	Salary December, 1882	250 00
184	" 30	T. J. Burrill	" "	150 00
185	" 30	S. W. Shattuck	" "	150 00
186	" 30	E. Snyder	" "	150 00
187	" 30	J. C. Pickard	" "	150 00
188	" 30	N. C. Rieker	" "	150 00
189	" 30	J. D. Crawford	" "	150 00
190	" 30	G. E. Morrow	" "	150 00
191	" 30	F. W. Prentice	" "	150 00
192	" 30	P. Roos	" "	100 00
193	" 30	L. O. Baker	" "	125 00
194	" 30	Wm. McMurtrie	" "	166 66
195	" 30	B. C. Judson	" "	166 66
196	" 30	C. H. Peabody	" "	90 00
197	" 30	E. A. Kimball	" "	125 00
198	" 30	N. S. Spencer	" "	80 00
199	" 30	J. Sondericker	" "	75 00
200	" 30	C. W. Rolfe	" "	90 00
201	" 30	H. Slauson	" "	40 00
202	" 30	E. B. Morse	" "	100 00
203	" 30	A. B. Baker	" "	50 00
	1883.			
204	June 15	Marshall Field & Co	Matting	63 78
205	" 15	Central Telephone Co	Rent of inst. 1st qr	15 00
206	" 15	Agricultural Department	Farm expenses December, 1882	262 72
207	" 15	Randolph Birkholz	Painting	9 15
208	" 15	C. & U. Gas Co	Gas November and December, 1882	91 80
209	" 15	W. T. Pratt	Painting and roof repairing	93 91
210	" 15	J. C. Lewis	Mason work	13 20
211	" 15	B. C. Beach & Co	Coal	12 50
212	" 15	Star Coal Manufacturing Co	"	240 00
213	" 15	A. J. Stoneburner	Fireman's salary	49 00
214	" 15	Am. Phil. Association	Book	1 50

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
215	Jan. 15	I. B. & W. Ry	Freights	$13 58
216	" 15	M. A. Brown	Advertising	10 50
217	" 15	Thos. Wright & Co	Castings	9 84
218	" 15	G. W. Parker	Work in Arch. shops	50 28
219	" 15	A. Barr	Lumber	30 60
220	" 15	American Express Co	Charges	10 65
221	" 15	Luddington, Wells & Van Schaik Co	Lumber	171 98
222	" 15	G. M. Brown	Work in armory	15 21
223	" 15	George Ely	Forging	2 40
224	" 15	J. F. Wollensak	Blank keys	2 34
225	" 15	Grace Peabody	Salary December, 1882	11 50
226	" 15	J. P. Stewart	Hauling	2 50
227	" 15	S. W. Shattuck	Students' labor pay-roll Dec. 1882	193 52
228	" 31	S. H. Peabody	Salary, January, 1883	250 00
229	" 31	T. J. Burrill	" "	150 00
230	" 31	S. W. Shattuck	" "	150 00
231	" 31	E. Snyder	" "	150 00
232	" 31	J. C. Pickard	" "	150 00
233	" 31	N. C. Ricker	" "	150 00
234	" 31	J. D. Crawford	" "	150 00
235	" 31	G. E. Morrow	" "	150 00
236	" 31	F. W. Prentice	" "	150 00
237	" 31	P. Roos	" "	100 00
238	" 31	I. O. Baker	" "	125 00
239	" 31	Wm. McMurtrie	" "	166 66
240	" 31	B. C. Jillson	" "	166 66
241	" 31	C. H. Peabody	" "	90 00
242	" 31	E. A. Kimball	" "	125 00
243	" 31	N. S. Spencer	" "	80 00
244	" 31	J. Sondericker	" "	75 00
245	" 31	C. W. Rolfe	" "	90 00
246	" 31	H. Slauson	" "	40 00
247	" 31	E. P. Morse	" "	100 00
248	" 31	A. B. Baker	" "	50 00
249	Feb. 15	S. H. Peabody	Expenses to Agricultural Convention	61 30
250	" 15	A. H. Rolfe & Co	Periodicals	91 75
251	" 15	H. A. Kenyon	"	103 70
252	" 15	S. W. Shattuck	Students' labor pay-roll	186 41
253	" 15	Eimer & Amend	Chemicals and apparatus	222 47
254	" 28	S. H. Peabody	Salary, February, 1883	250 00
255	" 28	T. J. Burrill	" "	150 00
256	" 28	S. W. Shattuck	" "	150 00
257	" 28	E. Snyder	" "	150 00
258	" 28	J. C. Pickard	" "	150 00
259	" 28	N. C. Ricker	" "	150 00
260	" 28	J. D. Crawford	" "	150 00
261	" 28	G. E. Morrow	" "	150 00
262	" 28	F. W. Prentice	" "	150 00
263	" 28	P. Roos	" "	100 00
264	" 28	I. O. Baker	" "	125 00
265	" 28	B. C. Jillson	" "	166 66
266	" 28	Wm. McMurtrie	" "	166 66
267	" 28	C. H. Peabody	" "	90 00
268	" 28	E. A. Kimball	" "	125 00
269	" 28	N. S. Spencer	" "	80 00
270	" 28	J. Sondericker	" "	75 00
271	" 28	C. W. Rolfe	" "	90 00
272	" 28	H. Slauson	" "	40 00
273	" 28	E. P. Morse	" "	100 00
274	" 28	A. B. Baker	" "	50 00
275	" 28	A. J. Stoneburner	" January, 1883	49 00
276	" 28	W. H. Stoneburner	13½ nights' firing	23 62
277	" 28	D. L. T. Bronson	1 night firing	1 50
278	" 28	Grace Peabody	Salary, January, 1883	15 38
279	" 28	Gustave Klingenspor	" "	37 50
280	" 28	C. F. Adams	Specimens for cabinet	1 50
281	" 28	Robinson & Burr	Castings and work	35 19
282	" 28	W. B. Brancher	Band music	5 00
283	" 28	S. Roughton	Firing in Mechanical shops	10 94
284	" 28	G. W. Parker	Work in Architectural shops	13 50
285	" 28	S. W. Stratton	Blue printing	4 66
286	" 28	G. Denerlich	Books	5 78
287	" 28	James A. Laird	Service as special police	6 00
288	" 28	Illini	Printing	41 55
289	" 28	T. J. Burrill	Corr. Secretary's salary, 3 months	50 00
290	" 28	S. W. Shattuck	Bus. Agent's salary, 3 months	75 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
291	Feb. 28	E. Snyder	Rec. Secretary's salary, 3 months	$50 00
292	" 28	G. E. Morrow	Salary Farm Supt., 3 months	50 00
293	" 28	Western Edison Light Co	Lamps	8 50
294	" 28	Theodore Kalb	Crucibles	2 75
295	" 28	Agricultural Dept	Farm expenses, January, 1883	263 43
296	" 28	DuQuoin Coal Mg. Co	8 cars coal	226 10
297	" 28	Western Electric Co	Bell and battery	15 70
298	" 28	Enterprise Coal Co	1 car coal	28 00
299	" 28	C. & U. Gas Co	Gas, January, 1883	100 20
300	" 28	Jansen, McClurg	Books	15 50
301	" 28	Henry Horn	1 car coal	30 00
302	" 28	Smith, Vaile & Co	Packing	1 00
303	" 28	Eimer & Amend	Platinum foil	8 67
304	" 28	Trevett Bros.	Iron	2 82
305	" 28	Peter Henderson	Seeds	4 23
306	" 28	Am. Society of C. E.	Publications	30 00
307	" 28	Mapes Peruvian Guano Co.	Samples	2 00
308	" 28	Eichberg Bros	Oil cloth	1 05
309	" 28	C. & U. Gas Co	Gas, February, 1883	37 00
310	" 28	Crane Bros. Mfg. Co	Hardware	10 27
311	" 28	Agricultural Department	Farm expenses, 1883	138 95
312	" 28	I. C. R. R.	Advanced freights	2 62
313	" 28	H. Swannell	Chemicals	10 89
314	" 28	G. E. Morrow	Expenses at Agricultural Institute	12 40
315	" 28	G. C. Willis	Rubber and towels	10 25
316	" 28	Champaign Co. Gazette	Printing	88 50
317	" 28	Springfield Journal	Subscription	10 00
318	" 28	Clark Rush	Work on University barn	8 00
319	" 28	DuQuoin Coal Mg. Co	4 cars coal	103 75
320	" 28	G. M. Brown	Work in armory	7 12
321	" 28	Stokeley Roughton	Firing in Mechanical shop	11 00
322	" 28	A. S. Hall	Specimen for cabinets	3 50
323	" 28	A. J. Stoneburner	Salary fireman, February, 1883	48 00
324	" 28	Emma C. Piatt	Books	5 00
325	" 28	G. Klingenspor	Salary, February, 1883	50 00
326	" 28	L. W. Hoarn	Firing in greenhouse	3 45
327	" 28	Grace Peabody	Salary, February, 1883	13 50
328	" 28	M. E. Lapham	Lumber	35 50
329	" 28	Trevett & Green	Hardware	27 09
330	" 28	" "	Plumbing	86 57
331	" 28	Crane Bros. Mfg. Co	Packing and valves	14 00
332	" 28	" " " "	Pipe and fittings	31 99
333	" 28	Architectural Dept	Work and materials	88 75
334	" 28	Mrs. Abbie Wilkinson	Organist and music fees	98 00
335	" 28	Architectural Dept	Work for other Depts	79 33
336	" 28	Mechanical Dept	" " "	233 64
337	" 28	W. H. Stoneburner	Night firing and work	14 35
338	" 28	Mechanical Dept	Work and materials	69 05
339	" 28	R. S. Wilber	Hauling	156 50
340	" 28	W. T. Pratt	Roof repair	11 67
341	" 28	Rudolf Birkholz	Glazing	4 90
342	" 28	Fuller & Fuller	Glass	14 99
343	" 28	Anton Iten	Work on grounds	9 12
344	" 28	I. C. R. R. donation	Freights for 6 months	850 35
345	" 28	S. W. Shattuck	Student labor pay-roll	164 11
346	" 28	" "	Petty exp. Dec. '82, Jan. and Feb. '83	33 65
347	" 28	E. N. McAllister	Post for 3 months to date	86 24
348	Mar. 14	Geo. F. Kenower	Expense to Board meeting	15 25
349	" 14	Alexander McLean	" " "	24 65
350	" 14	R. B. Mason	" " "	4 00
351	" 14	R. N. Paden	" " "	14 00
352	" 14	S. M. Millard	" " "	20 00
353	" 31	S. H. Peabody	Salary, March, 1883	250 00
354	" 31	T. J. Burrill	" "	150 00
355	" 31	S. W. Shattuck	" "	150 00
356	" 31	E. Snyder	" "	150 00
357	" 31	J. C. Pickard	" "	150 00
358	" 31	N. C. Ricker	" "	150 00
359	" 31	J. D. Crawford	" "	150 00
360	" 31	G. E. Morrow	" "	150 00
361	" 31	F. W. Prentice	" "	150 00
362	" 21	P. Roos	" "	100 00
363	" 31	I. O. Baker	" "	125 00
364	" 31	Wm. McMurtrie	" "	166 66
365	" 31	B. C. Jillson	" "	166 66
366	" 31	C. H. Peabody	" "	90 00
367	" 31	E. A. Kimball	" "	125 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
368	Mar. 31	N. S. Spencer	Salary, March, 1883	$80 00
369	" 31	J. Sondericker	" "	75 00
370	" 31	C. W. Rolfe	" "	90 00
371	" 31	H. Slauson	" "	40 00
372	" 31	E. P. Morse	" "	100 00
373	" 31	A. B. Baker	" "	50 00
374	Apr. 14	A. H Roffe & Co	Periodicals	3 81
375	" 14	Grace Peabody	Salary, March, 1883	16 75
376	" 14	A. J. Stoneburner	Salary as fireman, March, 1883	47 50
377	" 14	L. W. Hoarn	Brooms, etc	5 62
378	" 14	J. Bartolomie & Co	Packing model	24 75
379	" 14	Gustave Klingenspor	Salary, March, 1883	50 00
380	" 14	S. D. Dukes	For hauling and manure	19 85
381	" 14	Publishers Illini	Printing	28 50
382	" 14	Janus n, McClurg & Co	Books	160 95
383	" 14	Horticultural Dept	Pay-roll on grounds	15 39
384	" 14	Agricultural Dept	Farm expense, March, 1883	281 25
385	" 14	W. A. Boring	Chapel decoration	4 06
386	" 14	N. S. Spencer	Expense for hauling	3 90
387	" 14	W. B. Brancher	Salary of band leader	15 00
388	" 14	Signal Printing Co	One portfolio	2 75
389	" 14	DuQuoin Coal Mg. Co	Five cars of coal	125 00
390	" 14	W. F. Lambden & Co	Mat	1 10
391	" 14	Central Telephone Co	Instrument, second quarter, 1883	10 10
392	" 14	S. W. Shattuck	Students' pay-roll, March, 1883	122 90
393	" 14	John S. Stott	Stationery	29 33
394	" 14	Moses King	Book	5 00
395	" 30	S. H. Peabody	Salary, April, 1883	250 00
396	" 30	T. J. Burrill	" "	150 00
397	" 30	S. W. Shattuck	" "	150 00
398	" 30	E. Snyder	" "	150 00
399	" 30	J. C. Pickard	" "	150 00
400	" 30	N. C. Ricker	" "	150 00
401	" 30	J. D. Crawford	" "	150 00
402	" 30	G. E. Morrow	" "	150 00
403	" 30	F. W. Prentice	" "	150 00
404	" 30	P. Roos	" "	100 00
405	" 30	I. O. Baker	" "	125 00
406	" 30	Wm. McMurtrie	" "	166 66
407	" 30	B. C. Jillson	" "	166 66
408	" 30	C. H. Peabody	" "	90 00
409	" 30	E. A. Kimball	" "	125 00
410	" 30	C. W. Rolfe	" "	90 00
411	" 30	J. Sondericker	" "	75 00
412	" 30	H. Slauson	" "	40 00
413	" 30	E. P. Morse	" "	100 00
414	" 30	A. B. Baker	" "	50 00
415	" 30	G. W. Parker	" "	65 00
416	" 30	G. Klingenspor	" "	50 00
417	May 15	Grace Peabody	" "	13 50
418	" 15	S. W. Shattuck	Students' labor pay-roll, April, 1883	147 79
419	" 15	A. H. Abbott & Co	Varnish	5 65
420	" 15	C. H. Evans & Co	Advertising	2 00
421	" 15	Rudolf Birkholz	Painting	6 40
422	" 15	D. L. T. Bronson	Team work	4 00
423	" 15	T. J. Burrill	Pay-roll of men	50 20
424	" 15	M. C. Lilly & Co	One flag	30 25
425	" 15	J. C. Vaughan	Seeds	20 83
426	" 15	S. W. Stratton	Blue printing	5 16
427	" 15	W. T. Pratt	Roof repairs	10 37
428	" 15	H. E. Parker	Work in shops	2 72
429	" 15	A. J. Stoneburner	Salary, April, 1883	30 00
430	" 15	W. C. Vittum	Lamp and chimney	3 75
431	" 15	Wm. Heffernan	Carriage hire	10 50
432	" 15	E. L. Walker	Advertising	24 00
433	" 15	Agricultural Department	Farm expenses, April, 1883	401 45
434	" 31	S. H. Peabody	Salary, May, 1883	250 00
435	" 31	T. J. Burrill	" "	150 00
436	" 31	S. W. Shattuck	" "	150 00
437	" 31	E. Snyder	" "	150 00
438	" 31	J. C. Pickard	" "	150 00
439	" 31	N. C. Ricker	" "	150 00
440	" 31	J. D. Crawford	" "	150 00
441	" 31	G. E. Morrow	" "	150 00
442	" 31	F. W. Prentice	" "	100 00
443	" 31	Peter Roos	" "	125 00
444	" 31	I. O. Baker	" "	

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
445	May 31	Wm. McMurtrie	Salary, May, 1883	$166 66
446	" 31	B. C. Jillson	" "	166 66
447	" 31	C. H. Peabody	" "	90 00
448	" 31	E. A. Kimball	" "	125 00
449	" 31	C. W. Rolfe	" "	90 00
450	" 31	J. Sondericker	" "	75 09
451	" 31	H. Slauson	" "	40 00
452	" 31	E. P. Morse	" "	100 00
453	" 31	A. B. Baker	" "	50 00
454	" 31	G. W. Parker	" "	65 00
455	" 31	G. Klingenspor	" "	50 00
456	" 31	Agricultural Department	Farm expense, May, 1883	557 56
457	" 31	Mechanical "	Work for other departments	58 46
458	" 31	" "	Work and material	94 09
459	" 31	Architectural "	Power and materials	60 00
460	" 31	Mrs. Abbie Wilkinson	Salary, spring term, 1883	63 00
461	June 15	Chas. Bennett	Expenses to meeting	6 68
462	" 15	Geo. F. Kenower	" "	12 70
463	" 15	G. A. Follansbee	" "	14 65
464	" 15	S. M. Millard	" "	21 50
465	" 15	W. R. Hickox	Attorney's fee	30 00
466	" 15	S. W. Shattuck	Salary, Business Agent	75 00
467	" 15	T. J. Burrill	" Corresponding Secretary	50 00
468	" 15	G. E. Morrow	" Farm Superintendent	50 00
469	" 15	E. Snyder	" Recording Secretary	50 00
470	" 15	Grace Peabody	" May 1883	14 38
471	" 15	W. B. Brancher	Services as band leader	15 00
472	" 15	A. J. Stoneburner	Fireman's wages	7 77
473	" 15	Michel Lenz	92 hours' work	13 80
474	" 15	T. J. Burrill	Pay-roll, Horticultural Department	97 18
475	" 15	S. W. Shattuck	Students' Lab. pay-roll, May, 1883	169 19
476	" 15	Western Banknote Eng. Co.	Diplomas	37 50
477	" 15	J. W. Bunn	Taxes on lands	2,469 06
478	" 15	F. W. Christern	Books	136 26
479	" 15	Jansen, McClurg & Co.	"	106 47
480	" 15	A. S. Clark	"	9 64
481	" 15	American Chem. Journal	Subscription, 1883	3 00
482	" 15	J. D. Crawford	Books	25 55
483	" 15	Carl Schoenhof	"	95 55
484	" 15	Eimer & Amend	Platinum foil	16 03
485	" 15	Western Electric Co.	Apparatus	17 00
486	" 15	C. F. Adams	Mounting specimens	7 25
487	" 15	Thos. Wright & Son	Castings	10 15
488	" 15	A. C. Brancher	Expense in decorating Chapel	2 00
489	" 15	W. T. Wood	Sundry expenses for Military Dep't	3 50
490	" 15	Rudolf Birkholz	Painting	6 40
491	" 15	S. H. Peabody	Traveling expenses	25 30
492	" 15	Jno. S. Stott	Stationery	8 75
493	" 15	S. W. Shattuck	Petty expenses, 3 months	50 96
494	" 15	E. N. McAllister	Postage, 3 months	60 00
495	" 15	J. F. Wollensak	Key blanks	2 79
496	" 15	M. E. Lapham	Lumber	6 56
497	" 15	Miller & Hunt	Flower pots	53 50
498	" 15	R. S. Wilber	Hauling	44 50
499	" 15	Du Quoin Coal	2 cars coal	43 75
500	" 15	A. B. Baker	Petty expense	6 80
501	" 15	Eimer & Amend	Apparatus	36 57
502	" 15	I. & U. Gas Co.	Gas for March, April, May, 1883	162 00
503	" 15	J. Sondericker	Lettering diplomas, etc	15 80
504	" 15	H. E. Parker	Work in Arch. shops	3 28
505	" 15	G. M. Brown	Work in Armory	13 06
506	" 15	W. H. Stockham	For postage stamps	2 83
507	" 15	Stearns & Co.	Barrel stucco	2 00
508	" 15	B. F. Harrison	One can	1 75
509	" 15	J. Bacon	Coal	16 55
510	" 15	I. B. & W. R. W.	Freight	3 38
511	" 15	Jansen, McClurg & Co.	Books	155 44
512	" 30	S. H. Peabody	Salary, June, 1883	250 00
513	" 30	T. J. Burrill	" "	150 00
514	" 30	S. W. Shattuck	" "	150 00
515	" 30	E. Snyder	" "	150 00
516	" 30	J. C. Pickard	" "	150 00
517	" 30	N. C. Ricker	" "	150 00
518	" 30	J. D. Crawford	" "	150 00
519	" 30	G. E. Morrow	" "	150 00
520	" 30	F. W. Prentice	" "	150 00
521	" 30	P. Roos	" "	100 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
522	June 30	I. O. Baker	Salary, June, 1883	$125 00
523	" 30	Wm. McMurtrie	" "	166 66
524	" 30	B. C. Jillson	" "	166 66
525	" 30	C. H. Peabody	" "	90 00
526	" 30	E. A. Kimball	" "	125 00
527	" 30	C. W. Rolfe	" "	90 00
528	" 30	J. Sondericker	" "	75 00
529	July 16	H. Slanson	" "	40 00
530	" 16	E. P. Morse	" "	100 00
531	" 16	A. B. Baker	" "	50 00
532	" 16	G. W. Parker	" "	65 00
533	" 16	G. Klingenspor	" "	50 00
534	" 16	Architectural Department	Labor and material	20 55
535	" 16	" "	" "	17 26
536	" 16	Mechanical "	" "	46 01
537	" 16	D. C. Taft	Collection of shells	450 00
538	" 16	B. F. Stevens	Books	245 00
539	" 16	Miley Wilson	Work 22 3-10 days	27 87
540	" 16	Grace Peabody	Salary, June, 1883	11 50
541	" 16	Illini	Printing, etc	25 40
542	" 16	Thos. E. Morrow	Wages, April, May and June, 1883	90 00
543	" 16	Horticultural Department	Expenses, June	57 72
544	" 16	Agricultural "	Farm expenses, June, 1883	543 64
545	" 31	S. W. Shattuck	Students' pay-roll, June, 1883	103 90
546	" 31	S. H. Peabody	Salary, July, 1883	250 00
547	" 31	T. J. Burrill	" "	150 00
548	" 31	S. W. Shattuck	" "	150 00
549	" 31	E. Snyder	" "	150 00
550	" 31	J. C. Pickard	" "	150 00
551	" 31	N. C. Ricker	" "	150 00
552	" 31	J. D. Crawford	" "	150 00
553	" 31	G. E. Morrow	" "	150 00
554	" 31	F. W. Prentice	" "	150 00
555	" 31	P. Roos	" "	100 00
556	" 31	I. O. Baker	" "	125 00
557	" 31	Wm. McMurtrie	" "	166 66
558	" 31	B. C. Jillson	" "	166 66
559	" 31	E. A. Kimball	" "	125 09
560	" 31	A. B. Baker	" "	50 00
561	" 31	G. Klingenspor	" "	50 00
562	" 31	Central Telephone Co	One quarter's rent, etc	15 00
563	" 31	Samuel Richardson	Work	4 35
564	" 31	Gauthiers & Villars	Sub. Mat. Jour	6 74
565	" 31	Brown & Co	One volume	5 50
566	" 31	Henry Dibble	Aquarium	13 75
567	" 31	American Express Co	Express	7 50
568	" 31	V. N. Edwards	Collecting specimens	10 00
569	" 31	R. Birkholz	Painting	7 60
570	" 31	W. Giese	Work	2 85
571	" 31	J. B. Clow & Son	Iron pipe	8 22
572	" 31	A. Barr	Hard lumber	24 87
573	Aug. 15	Agricultural Department	Farm expense, July	594 12
574	" 15	Horticultural "	July expense	112 42
575	" 15	S. W. Shattuck, B. Agent	Students' pay-roll, July	182 46
576	" 15	Grace Peabody	Regent's clerk, July	12 12
577	" 15	G. W. Parker	Salary foreman, July	74 60
578	" 15	Robinson & Burr	Iron pipe, etc	13 74
579	" 15	Anton Iten	Work	25 25
580	" 15	Rudolph Birkholz	Painting, etc	30 50
581	" 15	Ebenezer Fryer	Stone work	77 00
582	" 31	S. H. Peabody	Salary, August, 1883	250 00
583	" 31	T. J. Burrill	" "	150 00
584	" 31	S. W. Shattuck	" "	150 00
585	" 31	E. Snyder	" "	150 00
586	" 31	J. C. Pickard	" "	150 00
587	" 31	N. C. Ricker	" "	150 00
588	" 31	J. D. Crawford	" "	150 00
589	" 31	G. E. Morrow	" "	150 00
590	" 31	F. W. Prentice	" "	150 00
591	" 31	P. Roos	" "	100 00
592	" 31	I. O. Baker	" "	125 00
593	" 31	Wm. McMurtrie	" "	166 66
594	" 31	B. C. Jillson	" "	166 66
595	" 31	E. A. Kimball	" "	125 00
596	" 31	A. B. Baker	" "	50 00
597	" 31	G. Klingenspor	" "	50 00
598	" 31	Chas. T. Powner	Advertising	20 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
599	Aug. 31....	D. Appleton & Co	Books	$6 00
600	" 31....	W. Maltby	Use of piano	5 00
601	" 31....	A. B. Baker	Pay-roll of women	181 40
602	" 31....	Stearns & Co	Cement	4 25
603	" 31....	G. F Kimball,	Glass	6 00
604	" 31....	W. Manning	Work on grounds	2 81
605	" 31....	P. Coffey	Work on grounds, etc	6 67
606	" 31....	L. W. Horn	Work	67
607	" 31....	Thos. Kerr	Mason work, etc	173 15
608	" 31....	Samuel Richardson	Work	1 50
609	" 31....	Tice & Lynch	Expenses on books	3 45
610	" 31....	A Price	Teaming	2 00
611	" 31....	Tribune Co	Advertising	9 60
612	" 31....	Stock Journal Co	"	13 75
613	" 31....	Wm. F. Storey	"	9 60
614	" 31....	Star Coal Mining Co	Coal	115 00
615	" 31....	Theo. Kalb	Crucibles, etc	8 25
616	" 31....	W. Gardener & Sons	Drafting Inst	10 00
617	" 31....	W. T. Comstock	"	8 00
618	" 31....	Henry & Kariher	Oil, paints and soap	31 29
619	" 31....	L. B. & W. R. W	Freights	5 16
620	" 31....	T. J. Burrill	Salary Cor. Secretary, 3 months	50 00
621	" 31....	E. Snyder	Salary Recording Secretary, 3 months	50 00
622	" 31....	S. W. Shattuck	Salary Business Agent, 3 months	75 00
623	" 31....	G. E. Morrow	Salary Farm Supt., 3 months	50 00
624	" 31....	Horticultural Department	Salary expenses August, 1883	40 81
625	" 31....	S. W. Shattuck, B. Agt	Students' pay-roll, August	197 99
626	" 31....	G. W. Parker	Salary, etc., of foreman, August	72 76
627	" 31....	G. W. Burton	Sand and gravel	6 00
628	" 31....	A. B. Baker	Pay-roll of women	27 50
629	" 31....	S. W. Shattuck, B. Agt	Pay-roll of men	248 33
630	" 31....	Agricultural Department	Farm expense, August	960 75
631	" 31....	Signal Printing Co	Printing	19 50
632	" 31....	Jansen, McClurg & Co	Books	97 15
633	" 31....	Grace Peabody	Regent's clerk, August	9 12
634	" 31....	Carl Schoenhof	Books	27 85
635	" 31....	U. S. Patent Office	Binding reports	15 60
636	" 31....	M. E Lapham	Lumber	39 54
637	" 31....	Rudolph Firkholz	Painting	15 20
638	" 31....	Wm. H Toulke & Co	Tile	36 44
639	" 31....	H. Peddicord	Coupling	1 00
640	" 31....	Randolph Fire Clay Works	Sewer pipe	205 64
641	" 31....	J. W. Shuck	Plumbing	145 35
642	" 31....	C. J. Sabin	Sewer pipe	36 00
643	" 31....	M Corboy	4 water closets	161 00
644	" 31....	M. Lapham	Stone	168 08
645	" 31....	H. A. Allyn & Co	Metallic shingles	40 30
646	" 31....	Sutton & Sheldon	Brick and fire-clay	261 88
647	" 31....	E. P. Bullard	Engine lathe	248 00
648	" 31....	Besore Bros	Cement	43 60
649	" 31....	Crane Bros M'f'g Co	Pipe and fixings	21 68
650	" 31....	Trevett & Green	Hardware	60 80
651	" 31....	H. Swaunell	Chemicals, etc	16 32
652	" 31....	M. E. Lapham	Lumber	44 51
653	" 31....	A. P. Cunningham	Ink and glue	1 55
654	" 31....	Prairie Farmer Co	Advertising	11 20
655	" 31....	Farmer's Review Co	"	8 96
656	" 31....	Peterson & Lloyde	Sundries	13 65
657	" 31....	E. N. McAllister	Postage, June, July and August	48 00
658	" 31....	Star Coal Mining Co	9 cars coal	178 25
659	" 31....	S. W. Shattuck	Petty expense June, July and Aug	45 64
660	" 31....	Champaign Co. Gazette	Printing	262 50
661	" 31....	Hendey Machine Co	Shaper	323 75
662	" 31....	Ill. Central R. R	Freights	261 60
663	" 31....	Architectural Department	Work for other departments	191 49
664	" 31....	Architectural Department	Work and material	404 54
665	" 31....	Mechanical Department	Work for other departments	24 87
666	" 31....	Mechanical Department	Work and materials	115 41
667	" 31....	Horticultural Department	Work on grounds	137 27
1	Sept. 15....	S. M. Minard	Expense to September meeting	22 38
2	" 15....	R. N. Paden	" " "	11 75
3	" 15....	J. T. Pearman	Expense to meeting	10 00
4	" 15....	Charles Bennett	Expense to Board meeting	24 01
5	" 15....	Alex. McLean	" " "	38 08
6	" 15....	S. H. Peabody	Traveling expenses	128 65
7	" 15....	A. Barr (see 9)	Anvil blocks and lumber	14 00
8	" 15....	Joseph Fullman	16¼ days' work	24 38

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883			
9	Sept. 15	J. W. Bunn (see 7)	Premium on $10,000	$300 00
10	" 15	P. Coffee	13 days' work	25 50
11	" 15	Pat. Lamb	6¾ days' work	10 35
12	" 15	Morton E. Chase	Purchase of lots	450 00
13	" 30	S. H. Peabody	Salary, Sept., 1883	250 00
14	" 30	T. J. Burrill	" " "	166 66
15	" 30	S. W. Shattuck	" " "	166 66
16	" 30	E. Snyder	" " "	166 66
17	" 30	J. C. Pickard	" " "	166 66
18	" 30	N. C. Ricker	" " "	166 66
19	" 30	J. D. Crawford	" " "	166 66
20	" 30	G. E. Morrow	" " "	166 66
21	" 30	F. W. Prentice	" " "	150 00
22	" 30	P. Roos	" " "	116 66
23	" 30	I. O. Baker	" " "	150 00
24	" 30	Wm. McMurtrie	" " "	166 66
25	" 30	B. C. Jillson	" " "	166 66
26	" 30	C. W. Rolfe	" " "	100 00
27	" 30	J. Sondericker	" " "	90 00
28	" 30	E. A. Kimball	" " "	125 00
29	" 30	E. M. Hall	" " "	100 00
30	" 30	M. E. Darrow	" " "	60 00
31	" 30	A. W. Palmer	" " "	50 00
32	" 30	G. W. Parker	" " "	65 00
33	" 30	A. B. Baker	" " "	60 00
34	" 30	G. Klingenspor	" " "	50 00
35	Oct. 15	J. F. Parry	Plumbing	20 40
36	" 15	Am. Express Co.	Charges	1 55
37	" 15	W., St. L. and P. R. W.	Freight	11 58
38	" 15	Jeff. Morris	Work	7 72
39	" 15	D. D. Rose	Specimens for cabinets	10 00
40	" 15	L., B. and W. R. W.	Freight	65 36
41	" 15	Julius Welske	Mason work	7 00
42	" 15	Sylvester Ogg	Work	9 75
43	" 15	Christ. Grein	"	4 50
44	" 15	Rudolf Rirkholz	Painting	12 60
45	" 15	E. J. Sharp	Work on Herbarium	2 10
46	" 15	Anton Hen	Work on grounds	31 75
47	" 15	Thos. Keir	Mason work	76 35
48	" 15	Clark Rush	9 days' work	22 50
49	" 15	John F. Creek	17 " "	38 25
50	" 15	A. M. Allen	Metallic shingles	19 00
51	" 15	T. E. Cole	Work on grounds	6 88
52	" 15	Wm. Leary	Fireman's salary	30 00
53	" 15	Grace Peabody	Salary, October, 1883	13 13
54	" 15	S. W. Stratton	Paper and ruling	3 94
55	" 15	Western Rural	Advertising	28 00
56	" 15	C. Singbusch	3½ days' work	4 12
57	" 15	Horticultural Department	Sundry expenses	58 17
58	" 15	I. O. Baker	Field books index	2 50
59	" 15	F. W. Eberlen	Express on chem	3 15
60	" 15	West'n Union Tel. Co.	Dispatches and telephone	17 15
61	" 15	S. W. Shattuck	Students' pay-roll	175 69
62	" 15	Agricultural Department	Farm expenses, September, 1883	622 00
63	" 15	Palmer, Fuller & Co.	Sash and blinds	48 13
64	" 15	S. C. Lithography Co.	1,500 warrants	27 00
65	" 15	Marshall Field & Co	Curtains	13 42
66	" 15	R. S. Wilber	Hauling	117 00
67	" 15	Jansen, McClurg & Co	Books	22 08
68	" 15	A. M. Powell & Co.	Engine lathe	292 50
69	" 15	Henry Horn	Coal	69 00
70	" 15	A. Price	Teaming	2 50
71	" 15	Stearns & Co.	2 bbl. stucco	4 00
72	" 15	C. and U. Gas Co.	Lights to October 1, 1883	33 00
73	" 15	I. C. R. R.	Advanced freight	1 18
74	" 15	S. D. Kimbark	Anvils	112 20
75	" 15	P. Blaisdell & Co.	Hand-lathes	439 45
76	" 15	Detroit Lubricator Co.	Lubricator	11 25
77	" 15	H. A. Allyn & Co.	Metallic shingles	16 05
78	" 15	Whitall, Tatum & Co	Museum jars	10 25
79	" 15	Illinois State Register	Advertising	7 50
80	" 15	Illinois School Journal	"	13 75
81	" 15	Inter-Ocean Co.	"	34 00
82	" 15	School Herald	"	1 00
83	" 15	Anderson & Bainum	Plastering and patching	37 50
84	" 15	Springfield Journal	Advertising	7 00
85	" 15	E. F. Deiterichs	Valveoleum	20 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
86	Oct. 31....	S. H. Peabody.	Salary, October, 1883	$250 00
87	" 31....	T. J. Burrill	" "	166 66
88	" 31....	S. W. Shattuck	" "	166 66
89	" 31....	E. Snyder	" "	166 66
90	" 31....	J. C. Pickard	" "	166 66
91	" 31....	N. C. Ricker	" "	166 66
92	" 31....	J. D. Crawford	" "	166 66
93	" 31....	G. E. Morrow	" "	166 66
94	" 31....	F. W. Prentice	" "	150 00
95	" 31....	P. Roos	" "	116 66
96	" 31....	L. O. Baker	" "	150 00
97	" 31....	W. McMurtrie	" "	166 66
98	" 31....	B. C. Jillson	" "	166 66
99	" 31....	C. W. Rolfe	" "	100 00
100	" 31....	J. Sondericker	" "	90 00
101	" 31....	A. T. Woods	" "	40 00
102	" 31....	F. A. Kimball	" "	125 00
103	" 31....	E. M. Hall	" "	100 00
104	" 31....	M. E. Darrow	" "	60 00
105	" 31....	A. W. Palmer	" "	50 00
106	" 31....	G. W. Parker	" "	65 00
107	" 31....	A. B. Baker	" "	60 00
108	" 31....	G. Klingenspor	" "	50 00
109	" 31....	C. Rush	11 3-10 days' work	28 25
110	" 31....	Horticultural Dept	Work on boiler	11 24
111	" 31....	L., B. & W. R. W	Freights	10 28
112	" 31....	Robinson & Burr	Repairs and fittings	77 69
113	" 31....	Buff & Berger	Micrometer	6 00
114	" 31....	Thos. Wright & Son	Castings	27 88
115	" 31....	E. H. Sargent & Co	Chemical apparatus	4 07
116	Nov. 15....	M. Leary	Fireman's salary, October, 1883	30 00
117	" 15....	Grace Peabody	Salary, October, 1883	14 38
118	" 15....	D. McKinzie	C. and U. Directory	5 00
119	" 15....	John S. Stott	Stationery	14 10
120	" 15....	U. S. Express	Charges	4 75
121	" 15....	Ills. Cent. R. R	Adv. freight	10 88
122	" 15....	Thos. Wright & Son	Castings	30 85
123	" 15....	G. Brown	16 hours' work in shop	2 40
124	" 15....	H. E. Parker	Work in Architectural shop	3 56
125	" 15....	J. T. Creak	" "	60 75
126	" 15....	Agricultural Dept	Farm expense, October, 1883	673 27
127	" 15....	Trevett Bros.	Hardware	315 22
128	" 15....	Rudolf Birkholz	Painting and glazing	36 80
129	" 15....	Hamilton & Co	Sash and door	6 19
130	" 15....	L. O. Baker	Petty expense	1 49
131	" 15....	T. J. Burrill	Sundry expenses	36 05
132	" 15....	G. H. Greeley	Work in Armory	4 53
133	" 15....	W. T. Pratt	Roof repairs	4 88
134	" 15....	Larrabee & North	Tools and hardware	93 28
135	" 15....	Henry Horn	10 cars coal	230 00
136	" 15....	Decatur Review	Advertising	7 50
137	" "	Frost & Adams	Models	19 16
138	" 15....	Wm. Price	Calsomining	5 63
139	" 15....	E. H. Andrews & Co	Crayons and erasers	22 50
140	" 15....	L. F. Walden & Co	Advertising	8 00
141	" 15....	W. Mc Gregor & Co	Belting	91 93
142	" 15....	J. F. Wollensack	Hardware	8 00
143	" 15....	J. D. Garmody	Heater for greenhouse	190 00
144	" 15....	Robinson & Burr	Forging and fitting	21 85
145	" 15....	Signal Printing Co	Binding	116 44
146	" 15....	Jas. B. Clou & Sons	Valves and fittings	5 08
147	" 15....	Jones & Laughlin	Pulleys and shaftings	89 80
148	" 15....	Dallenbach Bros	Hog experiments	15 00
149	" 15....	A. Reichart & Co	Chemicals and apparatus	300 40
150	" 15....	Fuller & Fuller	Chemicals	26 05
151	" 15....	C. & U. Gas Co	Lights, October, 1883	48 00
152	" 15....	S. W. Shattuck	Students' labor, pay-roll, Oct., 1883	173 65
153	" 15....	Paul A. Garey	Drawing models	29 20
154	" 15....	S. W. Shattuck	Pay-roll of laborers	31 75
155	" 15....	James W. Onum & Co	Apparatus	276 87
156	" 30....	S. H. Peabody	Salary, Nov., 1883	250 00
157	" 30....	T. J. Burrill	" "	166 66
158	" 30....	S. W. Shattuck	" "	166 66
159	" 30....	E. Snyder	" "	166 66
160	" 30....	J. C. Pickard	" "	166 66
161	" 30....	N. C. Ricker	" "	166 66
162	" 30....	J. D. Crawford	" "	166 66

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883			
163	Nov. 30	G. E. Morrow	Salary, Nov., 1883	$166 66
164	" 30	F. W. Prentice	" "	150 00
165	" 30	P. Roos	" "	116 66
166	" 30	I. O. Baker	" "	150 00
167	" 30	Wm. McMurtrie	" "	166 66
168	" 30	B. C. Jillson	" "	166 66
169	" 30	C. W. Rolfe	" "	100 00
170	" 30	J. Sondericker	" "	90 00
171	" 30	A. T. Woods	" "	40 00
172	" 30	E. A. Kimball	" "	125 00
173	" 30	E. M. Hall	" "	100 00
174	" 30	M. E. Darrow	" "	60 00
175	" 30	A. W. Palmer	" "	50 00
176	" 30	G. W. Parker	" "	65 00
177	" 30	A. B. Baker	" "	60 00
178	" 30	G. Klingenspor	" "	50 00
179	" 30	Mrs. Abbie Wilkinson	Salary, fall term, 1883	50 00
180	" 30	S. W. Shattuck	Salary Business Agent, 3 mos., 1883	75 00
181	" 30	Wm. Leary	Salary, November, 1883	35 00
182	" 30	Grace Peabody	" "	13 25
183	" 30	Stu. L pay-roll	November, 1883	192 46
184	" 30	Agricultural Department	Expense, November, 1883	793 52
185	" 30	Horticultural "	Expense in Horticultural Dept	2 40
186	" 30	J. F. Creek	Work in shop	55 12
187	" 30	H. E. Parker	" "	3 04
188	" 30	Thos. Wright & Co	Castings	13 99
189	" 30	Agricultural Department	Team work for Horticultural Dep't	38 12
190	" 30	U. S. Express Co	Charges	1 80
191	" 30	A. Price	Hauling lumber	1 50
192	" 30	Illini	Printing	39 50
193	" 30	I. B. & W. R. W	Freights	10 35
194	" 30	C. U. Telephone Co	Repairs	3 50
195	" 30	Horticultural department	Work on grounds	45 50
196	" 30	Agricultural department	" " "	15 87
197	" 30	Rudolph Birkholz	Painting and glazing	21 70
198	" 30	L. C. Roberts	Band music	3 00
199	" 30	Anton Iten	Work on Blk S. S.	1 50
200	" 30	Pay-roll of workmen	Labor on grounds	40 93
201	" 30	Champaign Co. Gazette	Printing	28 10
202	" 30	Henry Horn	Lear coal	30 00
203	" 30	Walker & Mulliken	Furniture repairs	11 05
204	" 30	C. & U. Gas Co	Lights Nov. '83	54 00
205	" 30	H. Swannell	Chemicals and stationery	7 44
20	" 30	E. H. Sargent & Co	Chemicals	9 72
207	" 30	Im S. Stott	Envelopes	12 40
208	" 30	Abendroth & Root Mfg Co	Tubes and clamps	103 70
209	" 30	Western Electric Co	Zincs	1 20
210	" 30	W. W. Abbott	Mat	1 50
211	" 30	Lud., Wells, Van Shaik Co	Lumber	244 79
212	" 30	B. C. Beach & Co	½ ton Blossberg	4 25
213	" 30	Fuller & Fuller	Chemicals	1 40
214	" 30	Richards & Co	Apparatus	203 21
21	" 30	Ward & Howell	Cabinet specimens	16 60
216	" 30	Sutton & Sheldon	Brick	94 40
217	" 30	Jones & Laughlin	Iron	13 57
218	" 30	Trevett & Green	Hardware	149 86
219	" 30	M. E. Lapham	Lumber	188 82
220	" 30	R. S. Wilber	Hauling	93 90
221	" 30	Henry & Kariher	Oil paint, etc	43 67
222	" 30	Medart Pat. Pulley Co	Pulleys	13 78
223	" 30	Larrabee & North	Tools	37 60
224	" 30	Crane Bros. Mfg Co	Pipe and hardware	31 73
225	" 30	Wm. Price	Glass and paint	6 06
226	" 30	Fuller & Fuller	" " "	55 02
227	" 30	Zell, Schwabacher & Co	Alcohol	24 00
228	" 30	Jas. W. Queen & Co	Apparatus	25 60
229	" 30	Mrs. Abbie Wilkinson	Music fees	48 00
230	" 30	E. N. McAllister	Postage 3 months	38 20
231	" 30	S. W. Shattuck	Petty expenses 3 months	43 95
232	" 30	Mechanical department	Labor and material	222 37
233	" 30	" "	" " "	151 85
234	" 30	Architectural "	" " "	541 88
235	" 30	" "	" " "	56 03
236	" 30	R. N. Paden	Expenses to Board meeting	11 50
237	Dec. 15	S. M. Millard	" " "	19 68
238	" 15	Alexander McLean	" " "	23 70
239	" 15	Parker Earle	" " "	20 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1883.			
240	Dec. 15	Chas Bennett	Expenses to Board. meeting	$6 68
241	" 15	S. H. Peabody	" " Washington	76 30
242	" 15	Chas Bennett	Traveling expenses to Nebraska	54 20
243	" 15	H. Swannell	Oil	1 60
244	" 15	Robinson & Burr	Fittings and castings	21 93
245	" 15	Chicago Wh. Lead Oil Co	Oil and lead	50 24
246	" 15	Anderson & Bainum	Plastering	5 00
247	" 15	Thomas Kerr	1½ yards sand	1 80
248	" 15	Ward & Howell	Specimens	77 65
249	" 15	Ginn, Heath & Co	Books	5 40
250	" 30	S. H. Peabody	Salary, December, 1883	250 00
251	" 30	T. J. Burrill	" "	166 66
252	" 30	S. W. Shattuck	" "	166 66
253	" 30	E Snyder	" "	166 66
254	" 30	J. C. Pickard	" "	166 66
255	" 30	N. C. Ricker	" "	166 66
256	" 30	J. D. Crawford	" "	166 66
257	" 30	G. E. Morrow	" "	166 66
258	" 30	F. W. Prentice	" "	150 00
259	" 30	P. Roos	" "	116 66
260	" 30	I. O. Baker	" "	150 00
261	" 30	Wm. McMurtrie	" "	166 66
262	" 30	B. C. Jillson	" "	166 66
263	" 30	C. W. Rolfe	" "	100 00
264	" 30	J. Sonderieker	" "	90 00
265	" 30	A. T. Woods	" "	40 00
266	" 30	E. A. Kimball	" "	125 00
267	" 30	E. M. Hall	" "	100 00
268	" 30	M. E. Darrow	" "	60 00
269	" 30	A. W. Palmer	" "	50 00
270	" 30	G. W. Parker	" "	65 00
271	" 30	A. B. Baker	" "	60 00
272	" 30	G. Klingenspor	" "	50 00
	1884			
273	Jan. 15	Agricultural Department	Farm expenses, December, 1883	468 29
274	" 15	Horticultural Department	Expenses, December, 1883	3 90
275	" 15	L. C. Roberts	Salary band leader, F. T. 1883	15 00
276	" 15	Grace Peabody	Salary, December, 1883	10 25
277	" 15	Wm. Leary	Salary fireman, December, 1883	35 00
278	" 15	I. C. R. R. Co	Freight	6 55
279	" 15	Charles Kayser	Painting and glazing	3 50
280	" 15	W. T. Pratt	Repairs on roofs	6 00
281	" 15	J. T. Percy	Painting	8 25
282	" 15	H. E. Parker	Work in Architectural shops	3 58
283	" 15	Pay-roll of workmen	Labor on grounds, December, 1883	14 31
284	" 15	Robert Abernathy	Lettering	3 00
285	" 15	Jones Printing Co	1 Shipman file	1 50
286	" 15	I. O. Baker	English Field Books	2 00
287	" 15	Julius Wiltskey	Work on boiler	1 50
288	" 15	Dunham & Thompson	Teaming	8 00
289	" 15	Rudolf Birkholz	Painting and glazing	10 60
290	" 15	Anton Iten	Work	8 75
291	" 15	John F. Creak	Work in Architectural shops	32 51
292	" 15	J. E. Hendricks	Books	15 00
293	" 15	C. & U. Telephone Co	Rent of instrument 1st quarter 1884	15 00
294	" 15	F. M. Hunt	Work	7 76
295	" 15	J. C. Lewis	Mason work on boilers	7 78
296	" 15	Student labor pay-roll	December, 1883	141 21
297	" 15	I., B. & W. Ry	Freight	4 35
298	" 15	James B. Clow & Son	Fittings	42 45
299	" 15	Carl Shoenhof	Books	3 49
300	" 15	Illinois School Journal	Advertising	13 75
301	" 15	H. A. Kenyon	Periodicals	105 50
302	" 15	American Society of C. E.	Transactions, 1883	15 00
303	" 15	A. M. Powell & Co	Change seat for lathe	2 00
304	" 15	Springfield Journal Co	Subscription	5 00
305	" 15	Happy Hyatt	Hair seal	22 50
306	" 15	Richards & Co	Apparatus	18 18
307	" 15	Oliver Bros. & Phillips	Iron pickets	120 93
308	" 15	Trowell Bros.	Hardware	16 07
309	" 15	Wm. Hellerman	Teaming	6 00
310	" 15	Abernathy & Root M'f'g Co.	Tubes	60 00
311	" 15	Larson, McClurg & Co.	Books	14 97
312	" 15	C. & U. Gas Light Co.	Lights, December, 1883	39 00
313	" 15	J. A. Fay & Co	Chucks and belting	153 31
314	" 31	S. H. Peabody	Salary, January, 1884	250 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1884.			
315	Jan. 31	T. J. Burrill	Salary, January, 1884	$166 66
316	" 31	S. W. Shattuck	" "	166 66
317	" 31	E. Snyder	" "	166 66
318	" 31	J. C. Pickard	" "	166 66
319	" 31	N. C. Ricker	" "	166 66
320	" 31	J. D. Crawford	" "	166 66
321	" 31	G. E. Morrow	" "	166 66
322	" 31	F. W. Prentice	" "	150 00
323	" 31	P. Roos	" "	116 66
324	" 31	I. O. Baker	" "	150 00
325	" 31	Wm. McMurtrie	" "	166 66
326	" 31	B. C. Jillson	" "	166 66
327	" 31	C. W. Rolfe	" "	100 00
328	" 31	J. Sondericker	" "	90 60
329	" 31	A. T. Woods	" "	40 60
330	" 31	E. A. Kimball	" "	125 00
331	" 31	M. E. Darrow	" "	60 60
332	" 31	A. W. Palmer	" "	50 00
333	" 31	G. W. Parker	" "	65 00
334	" 31	A. B. Baker	" "	60 00
335	" 31	E. M. Hall	" "	100 00
336	" 31	G. Klingenspor	" "	50 00
337	Feb. 15	Agricultural Department	Farm expenses, January, 1884	303 65
338	" 15	Horticultural Department	Expenses, January, 1884	10 00
339	" 15	Wm. Leary	Fireman's salary, January, 1884	39 60
340	" 15	Grace Peabody	Salary, January, 1884	13 25
341	" 15	Anton Iten	58 hours shovelling coal	6 77
342	" 15	H. E. Parker	Work in shop	2 15
343	" 15	Rudolf Birkholz	Painting and glazing	10 80
344	" 15	F. M. Hurst	Work on yards and in firing	15 15
345	" 15	W. T. Pratt	Roof repairs	11 10
346	" 15	B. F. Carman	Brooms	3 50
347	" 15	L. B. & W. R. R	Freights	9 66
348	" 15	L. W. Falkner & Co	Paints and envelopes	2 05
349	" 15	Wm. McMurtrie	Petty expense	3 45
350	" 15	W. A. Baker	Night firing	1 50
351	" 15	Illini	Printing	17 50
352	" 15	Ormond Stone	Books	2 00
353	" 15	Jones & Laughlin	Balance of bill of shafting	16 00
354	" 15	Wab., St. L. & Pacific. Ry	Freights	2 57
355	" 15	A. B. Seymour	5 reams Herb. paper	17 50
356	" 15	L. V. Manspeaker	Sundries	3 55
357	" 15	Students' labor pay-roll	January, 1884	212 10
358	" 29	S. H. Peabody	Salary, February, 1884	250 00
359	" 29	T. J. Burrill	" "	166 66
360	" 29	S. W. Shattuck	" "	166 66
361	" 29	E. Snyder	" "	166 66
362	" 29	J. C. Pickard	" "	166 66
363	" 29	N. C. Ricker	" "	166 66
364	" 29	J. D. Crawford	" "	166 66
365	" 29	G. E. Morrow	" "	166 66
366	" 29	F. W. Prentice	" "	150 00
367	" 29	P. Roos	" "	116 66
368	" 29	I. O. Baker	" "	150 00
369	" 29	Wm. McMurtrie	" "	166 66
370	" 29	B. C. Jillson	" "	166 66
371	" 29	C. W. Rolfe	" "	100 00
372	" 29	J. Sondericker	" "	90 00
373	" 29	A. T. Woods	" "	40 00
374	" 29	E. A. Kimball	" "	125 00
375	" 29	E. M. Hall	" "	100 00
376	" 29	M. E. Darrow	" "	60 00
377	" 29	A. W. Palmer	" "	50 00
378	" 29	G. W. Parker	" "	65 00
379	" 29	A. B. Baker	" "	60 00
380	" 29	G. Klingenspor	" "	50 00
381	" 29	W. A. Wetzel	Instruction in elocution, Jan. & Feb., '84	120 00
382	" 29	S. W. Shattuck	Sal. Bus. Agt., 3 mos., ending Feb. 29, '84	75 00
383	" 29	Mrs. Abbie Wilkinson	Services as organist and inst., Winter term, 1884	70 60
384	" 29	Goodyear Rubber Co	Sheeting	1 06
385	" 29	L. C. Roberts	Band music	3 00
386	" 29	A. B. Baker	Sundry expenses	5 70
387	" 29	John S. Stott	Paper	5 40
388	" 29	Horticultural Department	Expense, February, 1884	14 23
389	" 29	H. E. Parker	Work in shop	2 64
390	" 29	W. A. Baker	Night firing	2 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1884.			
391	Feb. 29	Anton Iten	Work on sewer and coal bin	$16 75
392	" 29	T. M. Hurst	Work on boilers and grounds	9 25
393	" 29	Thos. Wright & Sons	Castings	26 17
394	" 29	Pub. Ill. State Directory	Advertising	25 00
395	" 29	Sylvester Ogg	Grading	4 50
396	" 29	William Sim	93 testaments	4 65
397	" 29	William Leary	Salary fireman, February, 1884	35 00
398	" 29	Students' labor pay-roll	February, 1884	165 65
399	" 29	Grace Peabody	Salary, February, 1884	13 25
400	" 29	Agricultural department	Farm expenses, February, 1884	367 65
401	" 29	Larrabee & North	Hardware	6 26
402	" 29	C. & U. Gas Co	Lights, January and February, 1884	84 00
403	" 29	Trevett & Green	Hardware	38 15
404	" 29	Fuller & Fuller	Glass	20 69
405	" 29	Stearns & Co	1 barrel stucco	2 00
406	" 29	Jas. B. Clow & Son	Brass rod	2 25
407	" 29	Jas. W. Queen & Co	Apparatus	201 25
408	" 29	Enterprise Coal Co	Coal	301 30
409	" 29	Crane Bros. Manuf'g Co	Pipe and fixtures	38 23
410	" 29	Abendroth & Root M'f'g. Co.	Gaskets	21 50
411	" 29	L. V. Manspeaker	Jars	2 88
412	" 29	E. H. Sargent & Co	Apparatus	2 65
413	" 29	C. W. Crary	Gear wheel	1 05
414	" 29	J. A. Fay & Co	Chuck	27 30
415	" 29	Carl Schoenhof	Books	4 31
416	" 29	U. S. Patent Office	Binding	15 60
417	" 29	Geo. W. Tryon	Books	33 00
418	" 29	A. H. Roffee & Co	Periodicals	96 75
419	" 29	Eaton Bros	Binding and printing	105 89
420	" 29	G. C. Willis	Toweling	5 44
421	" 29	Walker & Mulliken	Mats for gymnasium	68 25
422	" 29	Architectural department	Work for other departments	159 76
423	" 29	" "	Work and material	107 65
424	" 29	Mechanical "	Work for other departments	141 92
425	" 29	" "	Work and material	121 84
426	" 29	Ill. Cent. R. R. donation	Freights	1,084 00
427	" 29	American Express Co	Charges	2 25
428	" 29	L. C. Roberts	Salary band leader, W. T., 1884	15 00
429	" 29	W. & L. E. Gurley	Reprs. of Eng. Inst	2 05
430	" 29	C. H. Evans & Co	Advertising	5 00
431	" 29	E. P. Elliot & Co	Paper	17 37
432	" 29	E. N. McAllister	Postage, 3 months	35 72
433	" 29	S. W. Shattuck	Petty expenses, 3 months	30 50
434	Mar. 15	G. A. Follansbee	Expenses to Board meeting	17 13
435	" 15	S. M. Millard	" " "	15 68
436	" 15	Alexander McLean	" " "	24 65
437	" 15	Parker Earle	" " "	9 50
438	" 15	Champaign Gazette Co	Printing	31 50
439	" 15	St. Joseph Herald Co	Advertising	3 60
440	" 15	Bee Publishing Co., Omaha	"	12 00
441	" 15	Kansas City Journal Co	"	6 00
442	" 15	Springfield Journal Co	"	5 00
443	" 15	Iowa State Register	"	9 00
444	" 15	Inter-Ocean Publishing Co.	"	12 00
445	" 15	Illinois State Register	"	5 00
446	" 31	S. H. Peabody	Salary, March, 1884	250 00
447	" 31	T. J. Burrill	" "	166 66
448	" 31	S. W. Shattuck	" "	166 66
449	" 31	E. Snyder	" "	166 66
450	" 31	J. C. Pickard	" "	166 66
451	" 31	M. C. Ricker	" "	166 66
452	" 31	J. D. Crawford	" "	166 66
453	" 31	G. E. Morrow	" "	166 66
454	" 31	F. W. Prentice	" "	166 66
455	" 31	P. Roos	" "	150 00
456	" 31	I. O. Baker	" "	116 66
457	" 31	Wm. McMurtrie	" "	150 00
458	" 31	B. C. Jillson	" "	166 66
459	" 31	C. W. Rolfe	" "	166 66
460	" 31	J. D. Sondericker	" "	100 00
461	" 31	A. T. Woods	" "	90 00
462	" 31	E. A. Kimball	" "	40 00
463	" 31	E. M. Hall	" "	125 00
464	" 31	M. E. Darrow	" "	100 00
465	" 31	A. W. Palmer	" "	60 00
466	" 31	G. W. Parker	" "	50 00
467	" 31	A. B. Baker	" "	65 00
				60 00

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1884			
468	Mar. 31	G. Klingenspor	Salary, March, 1884	$50 00
469	Apr. 15	Students' labor pay-roll	" "	162 51
470	" 15	Grace Peabody	" "	15 25
471	" 15	F. N. Hurst	Night firing	2 88
472	" 15	H. H. Barber	Assistant in Phys. Lab.	22 50
473	" 15	Wm. Leary	Fireman's salary, March, 1884	35 00
474	" 15	Warren Maltby	Rent of piano	5 00
475	" 15	Brown & Co	Am. Cyclop., vol. I	5 50
476	" 15	Brown & Co	Encyclop. Brit., vol. I	5 50
477	" 15	H. E. Parker	Work in carpenter shops	2 64
478	" 15	B. F. Carman	Brooms	2 50
479	" 15	S. W. Stratton	Paper	12 50
480	" 15	Illini	Type and sundries	99 50
481	" 15	L. W. Faulkner	Envelopes	1 25
482	" 15	Rudolph Birkholz	Painting	4 20
483	" 15	C. W. Woodworth	Silkworms' eggs	10 00
484	" 15	Central Un. Telephone Co	Rent of instrument	15 00
485	" 15	W. A. Baker	Work on boiler-house	1 50
486	" 15	Anton Iten	Work on grounds	6 46
487	" 15	C. H. Rankin	Petty expenses	1 40
488	" 15	W. A. Wetzel	Instruction in elocution	100 00
489	" 15	Pay-roll of workmen	Work on grounds	30 67
490	" 15	Besore Bros	Lumber	23 95
491	" 15	Urbana Herald	Advertising	2 10
492	" 15	Illinois School Journal	"	13 75
493	" 15	Jansen, McClurg & Co	Books	9 34
494	" 15	C. and U. Gas Co	Lights for March	38 00
495	" 15	Stearns & Co	Stucco	2 00
496	" 15	Larrabee & North	Tools	9 06
497	" 15	Abendroth & Root M'f'g. Co.	Furnace fixings	5 18
498	" 15	E. H. Sargent	Platinum wire	3 00
499	" 15	Enterprise Coal Co	Coal	235 75
500	" 15	Agricultural Department	Expenses, March, 1884	321 32
501	" 30	S. H. Peabody	Salary, April, 1884	250 00
502	" 30	T. J. Burrill	" "	166 66
503	" 30	S. W. Shattuck	" "	166 66
504	" 30	E. Snyder	" "	166 66
505	" 30	J. C. Pickard	" "	166 66
506	" 30	N. C. Ricker	" "	166 66
507	" 30	J. D. Crawford	" "	166 66
508	" 30	G. E. Morrow	" "	150 00
509	" 30	F. W. Prentice	" "	116 66
510	" 30	P. Roos	" "	150 00
511	" 30	I. O. Baker	" "	166 66
512	" 30	Wm. McMurtrie	" "	166 66
513	" 30	B. C. Jillson	" "	100 00
514	" 30	C. W. Rolfe	" "	90 00
515	" 30	J. Sondericker	" "	40 00
516	" 30	A. T. Woods	" "	125 00
517	" 30	E. A. Kimball	" "	100 00
518	" 30	E. M. Hall	" "	60 00
519	" 30	M. E. Darrow	" "	50 00
520	" 30	A. W. Palmer	" "	65 00
521	" 30	G. W. Parker	" "	60 00
522	" 30	A. B. Baker	" "	50 00
523	" 30	G. Klingenspor	" "	19 00
524	May 15	P. H. Postel	Expenses to meeting	14 12
525	" 15	Grace Peabody	Salary, April, 1884	35 00
526	" 15	Wm. Leary	Fireman's salary, April, 1884	67 48
527	" 15	Workmen's pay-roll	Work on grounds	10 75
528	" 15	Lyon & Healy	Repair of band instrument	2 16
529	" 15	H. E. Parker	Work in shops	236 69
530	" 15	Agricultural Department	Farm expenses	14 00
531	" 15	B. Edwards & Co	Books	37 98
532	" 15	B. F. Stevens & Co	"	4 50
533	" 15	L, B. and W. R. W	Freights	2 75
534	" 15	J. A. Marquis	Book	100 00
535	" 15	R. R. Donnelly & Sons	Advertising	89 19
536	" 15	Horticultural Department	Expenses for April and May, 1884	1 90
537	" 15	Tyce & Lynch	Custom duties	155 60
538	" 15	Students' labor pay-roll	April, 1881	60 00
539	" 15	W. A. Wetzell	Instruction in elocution	1 85
540	" 15	E. H. Sargent & Co	Chemicals	17 15
541	" 15	Peterson & Lloyde	Stationery	10 06
542	" 15	Trevett Bros	Hardware	36 00
543	" 15	Champaign and U. Gas Co	Light, April, 1884	5 00
544	" 15	John Hopkins Univ	Reports of Biological Laboratory	

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No.	Date.	To whom.	For what.	Amount.
	1884			
545	May 15	S. H. Peabody	Sundry expenses	$28 09
546	" 15	Champaign Times	Advertising Nebraska lands	2 55
547	" 15	Neb. State Journal	Advertising	4100
548	" 15	P. Henderson & Co	Seeds	5 85
549	" 15	Abbie Wilkinson	Salary, spring term, 1884	50 00
550	" 15	W. A. Wetzell	Elocution fees, spring term, 1884	60 00
551	" 30	Enterprise Coal Co	Coal	22 00
552	" 30	Jones & Laughlin	Heading tools	11 26
553	" 30	F. W. Christern	Foreign periodicals	66 60
554	" 30	Jansen, McClurg & Co	Books	179 85
555	" 30	R. S. Wilber	Hauling	175 85
556	" 30	S. H. Peabody	Salary, May 1884	250 00
557	" 30	T. J. Burrill	" "	166 66
558	" 30	S. W. Shattuck	" "	166 66
559	" 30	E. Snyder	" "	166 66
560	" 30	J. C. Pickard	" "	166 66
561	" 30	N. C. Ricker	" "	166 66
562	" 30	J. D. Crawford,	" "	166 66
563	" 30	G. E. Morrow	" "	166 66
564	" 30	F. W. Prentice	" "	150 00
565	" 30	P. Roos	" "	116 66
566	" 30	L. O. Baker	" "	150 00
567	" 30	Wm. McMurtrie	" "	166 66
568	" 30	B. C. Jillson	" "	166 66
569	" 30	C. W. Rolfe	" "	100 00
570	" 30	J. Sondericker	" "	90 00
571	" 30	A. T. Woods	" "	40 00
572	" 30	E. A. Kimball	" "	125 00
573	" 30	E. M. Hall	" "	100 00
574	" 30	M. E. Darrow	" "	60 00
575	" 30	A. W. Palmer	" "	50 00
576	" 30	G. W. Parker	" "	65 00
577	" 30	A. B. Baker	" "	60 00
578	" 30	G. Klingenspor	" "	50 00
579	June 2	Crane Bro's M'f'g Co	Pipe and fittings	17 85
580	" 2	E. M. McAllister	Postage 3 months	36 00
581	" 2	Robinson & Burr	Castings	3 85
582	" 2	Wm. Heffernan	Teaming	1 00
583	" 2	Illini	Printing	51 00
584	" 2	J. W. Bunn	Taxes on lands	2,542 03
585	" 2	American Chem. Journal	Subscription 1884	3 00
586	" 2	Western Banknote Eng. Co.	Diplomas	43 75
587	" 2	J. Bacon	Coal	18 25
588	" 2	Tobin & English	Apparatus	59 50
589	" 2	E. P. Niles	Expenses of Insp. officer	15 00
590	" 2	Pay-roll of workmen	May, 1884	29 19
591	" 2	Jeff Morris	Hauling coal	1 00
592	" 2	C. J. Sabin	Grass seed	3 50
593	" 2	Agricultural department	Expense on farm, May, 1884	447 67
594	" 2	Jansen, McClurg & Co	Books	4 00
595	" 2	W. T. Pratt	Painting and glazing	19 78
596	" 2	L. C. Roberts	Serv. as band leader, spring term, 1884	15 00
597	" 2	C. & U. Gas Co	Lights, May, 1884	46 00
598	" 2	H. E. Parker	Work in shop	2 16
599	" 2	H. H. Barber	Asst. in Phys. Lab. S. term 1884	15 00
600	" 2	Grace Peabody	Salary May, 1884	14 37
601	" 2	W. A. Baker	Work in boiler house as fireman	16 85
602	" 2	S. W. Shattuck	Salary Bus. Agt. 3 months	75 00
603	" 2	W. A. Wetzel	Bal. Elo. salary	92 50
604	" 2	Trevett & Green	Hardware	46 62
605	" 2	Champaign Co. Gazette	Printing	41 85
606	" 2	D. Appleton & Co	Books	6 00
607	" 2	A. Price	Teaming	2 50
608	" 2	Horticultural department	Expenses May, 1884	136 64
609	" 2	Students' labor pay roll	May, 1884	173 95
610	" 16	Alexander McLean	Expenses to June Board meeting	26 38
611	" 16	Parker Earle	" " " "	7 50
612	" 16	G. W. Follansbee	" " " "	32 57
613	" 16	S. M. Millard	" " " "	17 78
614	" 16	Chas. Bennett	" " " "	7 00
615	" 16	John S. Stott	Paper and files	12 40
616	" 16	S. W. Stratton	Blue Printing, maps	3 00
617	" 16	M. E. Lapham	Lumber	97 85
618	" 16	J. Sondericker	Printing diplomas	17 65
619	" 16	Powner, Ackerman & Co	Advertising	75 00
620	" 16	Eaton Bros	Printing	11 00
621	" 16	Chas. W. Queen & Co	Apparatus	31 75

List of Bills—Continued.

No.	Date.	To whom.	For what.	Amount.
	1884			
622	June 16	W. H. Bullock	Condensor	$13 60
623	" 16	Mechanical Department	Power and materials, 3 months	73 22
624	" 16	Architectural "	Power, materials and 12 wk. benches.	300 00
625	" 16	Ganthiers Villars	Books	75 00
626	" 16	S. H. Peabody	Salary, June, 1884	250 00
627	" 16	T. J. Burrill	" "	166 66
628	" 16	S. W. Shattuck	" "	166 66
629	" 16	E. Snyder	" "	166 66
630	" 16	J. C. Pickard	" "	166 66
631	" 16	N. C. Ricker	" "	166 66
632	" 16	J. D. Crawford	" "	166 66
633	" 16	G. E. Morrow	" "	166 66
634	" 16	F. W. Prentice	" "	150 00
635	" 16	P. Roos	" "	116 66
636	" 16	I. O. Baker	" "	150 00
637	" 16	Wm. McMurtrie	" "	166 66
638	" 16	B. C. Jillson	" "	166 66
639	" 16	C. W. Rolfe	" "	100 00
640	" 16	J. Sondericker	" "	90 00
641	" 16	A. T. Woods	" "	80 00
642	" 16	E. A. Kimball	" "	125 00
643	" 16	E. M. Hall	" "	100 00
644	" 16	M. E. Darrow	" "	60 00
645	" 16	A. W. Palmer	" "	50 00
646	" 16	G. W. Parker	" "	65 00
647	" 16	A. B. Baker	" "	60 00
648	" 16	G. Klingenspor	" "	50 00
649	" 16	Wm. Leary	Work on ground	3 13
650	" 16	Mrs. Irvin	Cleaning building	13 50
651	" 16	Stearns & Co	Brick and clay	40 00
652	" 16	George Johnson	Repair brick work on boilers	4 80
653	" 30	John Burrill	1 hive of bees	6 00
654	" 30	Ganthiers Villars	Journal de Mathematiques	6 83
655	" 30	John Loney	3 days' work	3 75
656	" 30	Jas. A. Loney	2 8-10 days' work	3 50
657	" 30	The Herald	Printing	9 25
658	" 30	B. Tatarian	3 7-10 days' work on grounds	4 62
659	July 15	Grace Peabody	Salary, June, 1884	12 62
660	" 15	Students' labor pay-roll	Labor, June, 1884	152 59
661	" 15	Agricultural Department	Expenses, June, 1884	228 75
662	" 15	Horticultural Department	" "	259 50
663	" 15	M. B. Waite	Labor on Herbarium	14 50
664	" 15	A. Iten	Labor	3 82
665	" 15	W. A. Baker	"	26 94
666	" 15	Sylvester Ogg	Hauling	3 00
667	" 15	W. Maltby	Use of piano	6 00
668	" 15	Central Union Tel. Co	Rent of inst., July 1 to Oct. 1, 1884	15 00
669	" 15	Champaign Manf. Co	Lumber	1 83
670	" 15	Carl Schoenhof	Books	6 52
671	" 31	S. H. Peabody	Salary, July, 1884	250 00
672	" 31	T. J. Burrill	" "	166 66
673	" 31	S. W. Shattuck	" "	166 66
674	" 31	E. Snyder	" "	166 66
675	" 31	J. C. Pickard	" "	166 66
676	" 31	N. C. Ricker	" "	166 66
677	" 31	J. D. Crawford	" "	166 66
678	" 31	G. E. Morrow	" "	150 00
679	" 31	F. W. Prentice	" "	116 66
680	" 31	P. Roos	" "	150 00
681	" 31	I. O. Baker	" "	166 66
682	" 31	Wm. McMurtrie	" "	166 66
683	" 31	B. C. Jillson	" "	125 00
684	" 31	E. A. Kimball	" "	60 00
685	" 31	A. B. Baker	" "	50 00
686	" 31	G. Klingenspor	" "	13 20
687	" 31	Enterprise Coal Co	Coal	19 78
688	" 31	J. B. Clow & Son	Iron pipe, etc	42 00
689	" 31	Abendroth & Root M'fg. Co.	Boiler tubes	8 00
690	" 31	C. & U. Gas Co	Gas for June, 1884	5 00
691	" 31	Illinois State Register	Advertising	331 68
692	" 31	Champaign Co. Gazette	Printing catalogue	12 00
693	" 31	John S. Stott	Catalogue envelopes	15 36
694	" 31	Tribune Co	Advertising	13 75
695	" 31	Illinois School Journal	"	5 12
696	" 31	J. A. Fay & Co	Files	15 60
697	" 31	U. S. Patent Office	Binding	161 00
698	" 31	Jas. W. Queen & Co	Apparatus	

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No.	Date.	To whom.	For what.	Amount.
	1884.			
699	July 31	Robinson & Burr	Castings	$75 31
700	" 31	Jansen, McClurg & Co	Books	165 91
701	Aug. 15	Agricultural Department	Farm expenses, July, 1884	660 83
702	" 15	Horticultural Department	Expenses, July, 1884	118 70
703	" 15	G. W. Parker	Salary, etc., July, 1884	85 64
704	" 15	Students' labor pay-roll	Labor, July, 1884	232 23
705	" 15	Men's pay-roll	" "	57 63
706	" 15	M. B. Waite	Work on Herbarium	32 00
707	" 15	Rudolph Birkholz	Painting, etc	24 00
708	" 15	J. C. Lewis	Plastering	18 00
709	" 15	Grace Peabody	Work on library catalogues in Regent's office	22 27
710	" 15	Lord & Thomas	Advertising	49 90
711	" 31	S. H. Peabody	Salary, August, 1884	250 00
712	" 31	T. J. Burrill	" "	166 66
713	" 31	S. W. Shattuck	" "	166 66
714	" 31	E. Snyder	" "	166 66
715	" 31	J. C. Pickard	" "	166 66
716	" 31	N. C. Ricker	" "	166 66
717	" 31	J. D. Crawford	" "	166 66
718	" 31	G. E. Morrow	" "	166 66
719	" 31	F. W. Prentice	" "	150 00
720	" 31	P. Roos	" "	116 66
721	" 31	I. O. Baker	" "	150 00
722	" 31	Wm. McMurtrie	" "	166 66
723	" 31	B. C. Jillson	" "	166 66
724	" 31	E. A. Kimball	" "	125 00
725	" 31	A. B. Baker	" "	60 00
726	" 31	G. Klingenspor	" "	50 00
727	" 31	Grace Peabody	" "	9 00
728	" 31	W. A. Baker	Work on buildings	19 12
729	" 31	S. W. Shattuck	Salary Business Agent, 3 months	75 00
730	" 31	Agricultural Department	Farm expenses, August, 1884	308 85
731	" 31	Horticultural Department	Expense	62 95
732	" 31	A. Iten	Work on grounds	44 35
733	" 31	I., B. & W. Railroad	Freights	35 89
734	" 31	Students' labor pay-roll	Labor, August, 1884	204 09
735	" 31	Sam Dallenbach	Clock	3 00
736	" 31	Illinois Central Railroad	Freights, January to June	906 80
737	" 31	Levytype Co	Electrotypes	4 50
738	" 31	G. W. Parker	Salary, August, 1884	93 12
739	" 31	G. A. Huff	Carriage hire	1 25
740	" 31	Rudolph Birkholz	Painting and glazing	2 60
741	" 31	B. F. Chase & Co	Painting sign for Exposition	2 50
742	" 31	Barrett Bindery	Binders	7 50
743	" 31	M. A. Brown	Advertising	4 40
744	" 31	S. E. Woodworth	Labor on silkworms	45 80
745	" 31	C. T. Gossett	" "	2 62
746	" 31	T. J. Burrill	P. expense in silkworms experiments	6 46
747	" 31	J. C. Lewis	Mason work and plastering	18 45
748	" 31	A. B. Baker	Pay-roll of work in Chan. Bs	133 00
749	" 31	W. C. Vittum	Bowl	1 00
750	" 31	E. G. Holton	Trimming trees	4 00
751	" 31	Jeff Morris	Hauling	1 50
752	" 31	W. T. Pratt	Roof repairs	24 57
753	" 31	A. Iten	3 days' work	4 50
754	" 31	S. W. Shattuck	Petty expenses for 6 months ending August 30, 1884	71 23
755	" 31	Pay-roll of laborers	Work on buildings and grounds	61 40

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APPENDIX.

SUPPLEMENTARY PAPER

ON

"CHEMISTRY OF THE HOG."

By WILLIAM McMURTRIE, E. M., Ph. D.,

Professor of Chemistry.

[This paper was completed after the body of this report was printed.]

The subject of the general composition of the carcasses of farm animals, produced under varying conditions of breeding and feeding, is one that has received at the hands of agricultural chemists but a limited share of attention. Previous to 1883 almost the sole information we had on the subject was the result of the labors of Messrs. Lawes and Gilbert, on the celebrated Rothramstead farm, with some little work performed on the continent. And when, at the request of Col. C. F. Mills, President of the Illinois Swine Breeders' Association, we undertook to collate some facts relative to the chemistry of the hog, the dearth of such information, especially as regards American stock, became apparent. Nothing could be gleaned bearing upon the composition of the carcasses of the several well-known breeds, and in the limited time then at command we undertook the slaughter and analysis of selected animals to determine these relations. It was our intention to secure animals of the more prominent breeds, fed according to the generally adopted methods of the best managed Illinois farms, and brought to the condition and weight usually considered best suited for market, but it proved that this was more easily planned than accomplished. On making search for animals just such as were desired, not all the breeds we had in mind could be found. Thus it seemed desirable that the series for the purpose should include animals of the same sex and age, from the Poland China, Berkshire, Chester, Sussex, Essex and Duroc breeds; but, upon inquiry among the breeders of the section, it appeared that the first two breeds above named were the favorites, and representative animals of only these two breeds could therefore be secured.

The investigation was unsatisfactory on very many accounts, the principal being the comparatively unreliable character of the source

from which the material was obtained. This was quite apparent at the time the results were presented, and breeders in the different classes promptly promised to assist in the further prosecution of the investigation, by contribution of animals of known history and of proper age and sex. Relying upon these promises, when the time arrived for the beginning of the experiment, requests were addressed to prominent breeders that they forward good representative animals of the breed in which each one respectively was interested, to be used in this connection. We were, however, greatly disappointed in the responses received, because the only one who agreed to furnish the desired material was Mr. George W. Stoner, of LaPlace, Ill. Mr. Stoner promptly sent to the University a young Duroc barrow that was used in the experiment.

The objections raised against the previous experiments, and to any others that might be made with animals contributed directly, were that they would not be subject to the same conditions of feeding and management, and therefore would not be fairly comparable. To meet these objections, it was determined to submit the several animals to the same treatment on the University farm for a given period, and then slaughter for analysis. At the same time it appeared desirable to so conduct the feeding as to determine, if possible, the influence of the character of the food upon the production of fat and flesh. The investigation about to be described turned then upon two points: 1. the relative proportions of fat and flesh produced in animals of the same age and sex of the several breeds, fed in the same manner, and 2d, the influence of the character of the food upon production of fat and flesh in animals of the same breed, age and sex.

The difficulty of realizing all these conditions may be realized from what has already been said. It was impossible to secure contributions of pure bred animals suited to the purpose, and we therefore utilized the stock of the University farm, taking a Poland China sow, a Berkshire sow, a Poland China Barrow, a Berkshire barrow, and two cross-bred barrows of Poland China-Berkshire stock. These, together with the Duroc barrow contributed by Mr. Stoner, constituted the material for the experiment.

The delay in securing material, caused by the profitless correspondence with the several breeders, caused an unfortunate postponement of the beginning of the experiment, which was still further delayed by the excessively cold weather prevailing. The duration of the feeding was not therefore all that could be desired. It began March 14 and continued 45 days. It was intended that the composition of the ration should be graduated according to the directions of Wolff for the production of the best results in fattening, that is beginning with a nutritive ratio of 1 : 5.5 and widening to 1 : 6.5 or 7. At the same time it was deemed advisable to distribute the animals in pairs and feed the different couples respectively differently; that is, so that each one should rations having a different nutritive ratio from the others. The nutritive ratio is here understood to mean, of course, the relation between the digestible nitrogenous or albuminous constituents of the food, and the digestible non-nitrogenous, or carbohydrate constituents.

The food chosen was corn and linseed meal. In these foods the nutritive ratios usually range about 1:8 and 1:2.5 respectively. But on account of the poor quality of the corn of 1883 and the rather inferior quality of the linseed meal procured, these ratios were not realized, and what we had proved to be 1:8.94 and 1:4.7 respectively. This is shown in the following statement of results of analysis of these products:

ANALYSIS OF INDIAN CORN AND LINSEED MEAL FED TO EXPERIMENTAL SWINE.

	Corn.	Linseed Meal.
Moisture	14 675	12.45
Fat	1.14	7.86
Albuminoids	9 99	18.50
Sugar	1.423	0.24
Dextrine	0.555	2.38
Gum	1.47	1.215
Starch	69.10	39.438
Cellulose	1.05	18 175
	99.393	100.968
Nutritive ratio	1:8.94	1:4.7

Calculations of rations were based principally upon the averages of the published analysis of these products, and the animals divided into four lots were fed respectively with mixtures in which the relations of linseed meal to corn were 1:1, 1:2, 1:5, 0:1. These furnished corresponding nutritive ratios as follows: 1:6.82, 1:7.56, 1:8.23, 1:8.94. In view of the fact that the ratios were so wide it would appear that lots 2 and 3 had almost practically the same ratio.

The arrangement of the animals, the mixtures fed, the periods of feeding and the increase of weight during the several periods of the experiment are shown in the following table:

RECORD OF FEEDING AND GAIN IN LIVE WEIGHT OF EXPERIMENTAL SWINE.

Breed and Sex of Animal Represented.	Composition of Ration. Proportions of Linseed Meal.		Corn Meal.	Live Weights in Pounds. Mar. 14	Mar. 28	Apr. 14	Apr. 28	Total gain.	Average Gain per day.
Poland China Sow	½	to	½	130	143	156	162	30	0.66
Berkshire Sow	½	"	½	141	153	169	174	33	0.73
Poland Barrow	⅓	"	⅔	136	153	175	175	41	0.91
Berkshire Barrow	⅙	"	⅚	130	138	147	156	26	0.57
Crossbred Barrow	⅙	"	⅚	151	158	162	165	14	0.33
Duroc Barrow	⅙	"	⅚	130	138	160	175	45	1.00
Crossbred Barrow	0	"	1	167	173	193	193	26	0.57

The preparation of the feed mixtures, the feeding and care of the animals were conducted under the direction of Prof. Geo. E. Morrow, Director of the University farm. The animals were enclosed in separate pens, and given of the feed as much as they would con-

sume. As indicated in the table all the animals were weighed at the beginning of the experiment and at intervals during the period of feeding. Fortunately all the pure bred barrows which were of about the same age, also had about the same weight, and since the feed in each case was practically so nearly of the same composition the increase in weight will be fairly comparable. It appears that of the three breeds as represented in these animals the Duroc is the most prolific as regards increase in weight, though not greatly superior with this regard to the Poland China. The Berkshire in this case proved to be decidedly inferior.

The increase of weight, as illustrated in the total gain during the period of feeding and in the average gain per day, as given for the cross bred animals, would seem to indicate that the animals deteriorate as a result of crossing, because in this case their increase in weight is lower than the animals of the breeds from which they sprung, and as an average lower than that of any of the animals represented. And while in the barrows the Poland China takes the lead with regard to increase in weight, in the sows the Berkshire has the preference. Yet the figures in this case are doubtless untrustworthy, because upon slaughter it was developed that the animals were pregnant, a fact previously unknown. Indeed, when this fact is taken into account, their actual or net gain in weight proved to be about the same. But at any rate it would be manifestly unfair to compare the animals with the barrows in the consideration of the results of feeding either as regards the total gain or the composition of the carcass.

At the conclusion of the period of feeding the animals were all slaughtered on the same day, in fact during the same afternoon. They were all weighed just before being taken to the slaughter house, and during the process of slaughter the several parts were separately taken and weighed. While the animals were being slaughtered and dressed, the blood, hair, abdominal and thoracic viscera, etc., were carefully weighed. The carcass was allowed to hang over night to harden and on the following day was cut up. In the latter process each carcass was divided in the direction of the spinal column into as nearly as possible two equal parts, both parts carefully weighed, one of them reserved for store product and the other taken for analysis. This latter was treated in the following manner: First the head, feet and leaf lard were removed. Then the side fat was taken off. The flesh was next separated from the bones as completely as possible, then the side fat was cut up, the skin and particles of flesh it contained being carefully taken away so as to leave all the fat but no portions of extraneous protein substance. After this the superfluous fat was pared off from the flesh. When all the separations were complete, each part was carefully weighed, and the data obtained in this way and during the process of slaughter are recorded in the following table:

Record of Slaughter of Experimental Swine.

Parts Weighed.	Pol'nd China Sow.		Berkshire Sow.		Pol'nd China Barrow.		Berkshire Barrow.		Cross Bred Barrow.		Duroc Barrow.		Cross Bred Barrow.		Actual weight, pounds.....	Per cent. of live weight.....
	Actual w'ght, pounds.....	Per cent. of live weight.	Actual w'ght, pounds.....	Per cent. of live weight.	Actual w'ght, pounds.....	Per cent. of live weight.	Actual w'ght, pounds.....	Per cent. of live weight.	Actual w'ght, pounds.....	Per cent. of live weight.	Actual w'ght, pounds.....	Per cent. of live weight.	Actual w'ght, pounds.....	Per cent. of live weight.		
Blood	4¼	2 61	4½	2.57	4½	2.57	3¼	2.08	4¼	2.57	4¼	2.43	4¾	2.46	.....	.....
Hair	1¼	0.70	1½	0.85	1	0 57	1	0.64	1¼	0.75	2	1 14	1	0.57	.....	.....
Uterus and contents	6	3.69	8½	4.87	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Entrails and contents	25	15.38	22¾	12.89	16½	9.43	15½	9.93	24½	14.84	22¼	12.71	1 ½	10.10	.....	.....
Lungs, liver, kidney, spleen, brain, tongue	7¼	4.46	7¾	4.44	2¾	1.57	5½	3 52	4	2 42	5½	3 14	6½	3.36	.....	.....
Flesh (lean)	49½	30.55	55	31.55	55	31.42	52	33.33	52	31 55	44	25.14	45	23.31	.....	.....
Bones (crude)	8	4.92	8½	4.87	8	4.57	9½	6 09	8½	5 75	8¼	5.00	10	5.78	.....	.....
Side fat	30	19.81	39	22.35	51	29.14	35	22.29	40	24.24	50	58 57	65½	36.21	.....	.....
Kidney fat	4	2 46	5	2.85	7	4 00	7	4 48	6½	4.09	6½	3.71	9½	4.92	.....	.....
Gut fat	3¾	2.30	2¼	1 28	4	2 28	3¾	2.40	4	2.42	2½	1.53	5	2.69	.....	.....
Skin	6¼	3.54	4½	2.57	4½	2 43	3¾	2.40	3½	2 12	4½	2.57	3½	1.81	.....	.....
Head and feet	13	8.00	10	5.72	12	6.80	13½	8 69	12	7.27	12	6 86	13	6.73	.....	.....
Total	158¼	97.26	169	96.91	168	95 78	149¾	96.05	160¾	97.42	162¾	92.80	187¼	96 93	.....	.....
Loss sustained	4¾	2.62	5½	3.15	7	4.00	6¼	4.00	4¼	2.57	12⅛	7.00	5¾	2.41	.....	.....
Net weight	162½	99.88	174½	100.06	175	99.78	156	100.05	165	99.99	175	99 80	195	99.352	.....	.....

It is not claimed that the separations of the parts was effected with any absolute degree of accuracy, but it is certain that the fat was perfectly pure and free from any particles of flesh. The loss sustained is in some cases abnormally high, but this is to be explained by the fact that the distance from the farm to the slaughter house was greater than was desirable, and hence the time intervening between the weighing and slaughter was not inconsiderable.

The figures here given for lean flesh and fat show some marked differences, and may be better seen in the following recapitulation, in which we have gathered the figures representing the percentages of the live weight in each case:

	Poland China Sow.	Berkshire Sow.	Poland China Barrow.	Berkshire Barrow.	Crossbred Barrow.	Duroc Barrow.	Crossbred Barrow.
Flesh.....	30.55	31.55	31.42	33.33	31.55	25.14	23.31
Fat.....	24.57	26.48	35.42	29.17	30.75	43.81	43.82

Of course these separations are wholly empirical, yet they afford partial indications of the relations between these two principal constituents of the carcass. But manifestly to determine accurately the influence of feeding upon the production of flesh and fat in animals of the same breed, or indeed in the relations between animals of different breeds, chemical analysis of the parts must be resorted to, and this was taken advantage of in the present instance, with the results detailed below.

The parts of the carcass divided after the manner just described were further reduced by cutting; and from each part, after thorough mixing, an average sample amounting to at least three pounds, was taken. These samples were carried to the laboratory, where they were reduced to pulp by pounding in a mortar. The material thus prepared was employed in the analyses.

The principal constituents to be determined were moisture, fat, protein substance, and ash. By protein substance we mean everything not fat or mineral matter free from moisture. It fairly represents flesh, pure, or the material developed from the nitrogenous constituents of the feed. In the process of analysis, the moisture was determined by taking a weighed quantity of the material and drying carefully at 110 c. to constant weight. The dried substance was then subjected to the continued and repeated action of ether until nothing more was dissolved. The loss upon drying represents moisture. The loss upon treatment with ether represents fat. For the determination of mineral matter, a weighed sample was strongly ignited until all carbonaceous matter was removed. The residue of ash was weighed. What remained above the sums of moisture, fat and ash, was reckoned as protein. This method of determination of protein was adopted because of the inconvenience of combustions with soda lime in presence of so much fat. The Kjeldahal method was tried, but at that time gave unsatisfactory results. In later experiments it has proven all that could be desired. By these methods the following results were obtained:

Detailed Results of Analyses of Different parts of Experimental Swine.
(In percentages of each part.)

POLAND CHINA SOW.

	Gut fat	Side fat	Kidney fat	Flash (lean)	Bones (crude)	Skin	Lungs, liver, kidney, spleen, brain, etc.	Head and feet.
Moisture	17.26	6.68	3.65	62.14	39.20	57.34	74.28	49.94
Fat	77.90	90.39	92.18	14.01	21.22	6.72	2.60	26.36
Ash	2.04	0.05	.002	1.36	25.60	0.29	0.006	10.13
Protein	2.80	2.88	4.16	22.49	13.98	41.65	23.114	13.57

BERKSHIRE SOW.

Moisture	16.20	8.41	2.30	66.40	42.02	49.30	74.04	48.10
Fat	79.93	89.30	93 46	16.38	21.16	4.92	1 90	32.00
Ash	0.92	0.63	0.006	0.089	29.64	0.96	0.004	9.64
Protein	3.77	1.656	4.034	17.131	7.18	45.68	24.056	10.26

POLAND CHINA BARROW.

Moisture	16.21	7.14	3.42	66.82	39.64	55.31	75.00	47.63
Fat	79.92	89.21	93.62	14 30	20.64	5.56	2.11	29.42
Ash	1.64	0.009	0.003	2.04	24.89	0.46	0.004	27.16
Protein	2.23	3.64	2.947	16.84	14.93	38.67	32.886	15.79

BERKSHIRE BARROW.

Moisture	16.34	6.74	2.46	65.35	43.23	46.66	76.10	50.63
Fat	79.26	91.20	94.84	12.04	20.46	5.34	0.96	24.30
Ash	1 06	0.008	0 005	0.846	27.49	0.863	0 005	8.30
Protein	3.34	2.052	3.195	21.76	8.72	47.13	22.93	16.77

CROSSBRED BARROW.

Moisture	13.16	4.34	1.65	65.42	39.34	51.34	74.38	52.24
Fat	83.45	93.20	94 20	14.32	21.22	6.72	2.40	18.34
Ash	1 89	0.092	0 006	2.001	24.96	0.099	0.088	13.63
Protein	1.50	2.368	4.144	20.06	14.48	40.95	23.13	16.79

DUROC BARROW.

Moisture	14.43	5.79	2.17	67.84	41.06	44.23	77.93	54.10
Fat	81.12	92 38	96.32	12.13	19 30	4.62	1 82	23.00
Ash	1.46	0.842	0.019	1.904	29.18	0.578	0.069	11.44
Protein	2.99	0.988	1.49	18.126	10.46	50.57	20.18	11.46

CROSSBRED BARROW.

Moisture	12.10	5.10	1.97	63.24	40.44	49.42	76.34	46.63
Fat	85.45	93.60	96.40	16.38	20.00	5.52	1.23	30.64
Ash	1.004	0.069	0.004	2.001	30.42	1.09	0.0094	10.56
Protein	1.446	1.231	1.624	17.779	9.14	43.97	22.42	18.20

Upon the examination of this table the variations from sample to sample do not appear very wide. As regards merchantable flesh, as represented in the crude flesh, we have a means for the determination of absolute terms of comparison. Of course the food value of this merchantable flesh depends upon its proportion of the nitrogenous compound protein present in it. It will depend both upon the moisture, which varies from 60 to 65 per cent., and the fat, which varies from 12 to 16 per cent. in round numbers. Applying these figures, then, to this crude flesh, we find that the protein contained in it, as referred to percentage of the carcass, is as follows, for each breed respectively:

	Poland Sow.	Berkshire Sow.	Poland Barrow.	Berkshire Barrow.	Crossbred Barrow.	Duroc Barrow.	Crossbred Barrow.
Protein	4.27	5.40	5.27	7.25	6.72	3.95	4.14
Fat	4.28	5.76	4.49	4.01	4.51	3.05	3.82

From these figures it would appear that the Berkshire is the most prolific as regards production of merchantable flesh. The Duroc Barrow stands lowest in the scale with this regard.

These figures are of course referred to live weight. But if we refer the results to only the edible portions of the animals, we have the relations set forth in the following table:

Composition of Edible Portions of Experimental Swine.

(Expressed in percents of carcass.)

POLAND CHINA SOW.

	Flesh.	Bones.	Side Fat	Kidney Fat.	Skin.	Head and Feet	Total.
Per cent. of carcass	44.694	7.223	27.088	3.612	5.643	11.738	100.08
Moisture	27.773	2.8364	1.809	0.131	2.897	5.862	41.303
Fat	6.261	1.5327	24.484	3.429	0.379	3.094	39.179
Ash	0.6078	1.849	0.013	0.00007	0.0163	1.189	3.675
Protein	10.042	1.009	0.780	0.150	2.350	1.592	15.923

BERKSHIRE SOW.

Per cent. of carcass	45.081	6.967	31.967	4.098	3.688	8.196	99.0352
Moisture	29.934	2.927	2.0888	0.094	1.818	3.943	40.4043
Fat	7.384	1.473	28.545	3.830	0.181	2.622	44.035
Ash	0.0401	2.065	0.2014	0.0003	0.0354	0.790	3.0925
Protein	7.8035	0.5002	0.5293	0.165	1.684	0.8217	11.5037

POLAND CHINA BARROW.

Per cent. of carcass	40.073	5.828	37.157	5.100	3.090	8.750	99.987
Moisture	26.780	2.310	2.653	0.1744	1.709	4.1676	37.794
Fat	5.731	1.205	33.146	4.755	0.1718	2.5742	47.583
Ash	0.8175	1.450	0.0033	0.00015	0.0142	0.6265	2.9116
Protein	6.749	0.870	1.3524	0.1508	1.195	1.3816	11.6988

Composition of Edible Portions of Experimental Swine—Continued.

BERKSHIRE BARROW.

	Flesh.	Bones.	Side Fat	Kidney Fat.	Skin.	Head and Feet	Total.
Per cent. of carcass	43.243	7.900	29 106	5.821	3.118	10.810	100.267
Moisture	28.260	3.415	1.962	0.1432	1.455	5.473	40.708
Fat	5.136	1.616	26.65	5.489	0.1665	2.633	41.690
Ash	0.3658	2.172	0 00232	0.0002	0 269	0 8972	3.7063
Protein	9.409	0.6889	0.5973	0.186	1.469	1 813	14.163

CROSSBRED BARROW.

Per cent. of carcass	42.362	6 924	31.558	5.498	2 951	9.775	99.9212
Moisture	27.713	2.724	1.369	0.097	1.515	5.106	38.524
Fat	6.066	1.469	29.41	5.179	0.198	1.793	44.108
Ash	0.847	1.737	0.0299	0.0003	0.029	1.332	3.9662
Protein	8.497	1.001	0.747	0.227	1.209	1.641	13.323

DUROC BARROW.

Per cent. of carcass	34.990	6.958	39.761	5.169	3 578	9.541	101.818
Moisture	23 74	2.857	2,302	1.122	1.583	5.162	36.776
Fat	4.245	1.342	36.723	4.979	0.1653	2.195	49.648
Ash	0.666	2 030	0.334	0.003	0.0206	1.091	4.9546
Protein	6.342	0.727	0 392	0.077	1.809	1.093	10.440

CROSSBRED BARROW.

Per cent. of carcass	29.90	6.644	46.178	6 330	2.325	8.631	100.008
Moisture	18 91	2 687	2 355	0.124	1 149	3.507	28.732
Fat	4.897	1.329	43 32	6.102	0.128	2.644	58.393
Ash	0.598	2.021	0.031	0.0002	0.025	0.9114	3.371
Protein	5.192	0.607	0.568	0 1028	1.022	1.572	9.063

Collecting the totals of the above tables we have the following:

General Composition of Edible Portions of Experimental Swine.

(Expressed in per cents. of carcass.)

	Moisture.	Fat.	Ash.	Protein.	Total.
1. Poland China sow	41.303	39 179	3.675	15.923	100.08
2. Berkshire sow	40.404	44.035	3.0925	11 5037	99.0352
3. Poland China barrow	37.794	47 583	2.9116	11.6988	99.9874
4. Berkshire barrow	40.708	41.690	3.7063	14.163	100.2673
5. Cross-bred barrow	38 524	44.108	3.9662	13.323	99.9212
6. Duroc barrow	36.776	49.648	4.9546	10 448	101.818
7. Cross-bred barrow	28.732	58.393	3.371	9.063	99.559

The same order of arrangement with regard to the flesh constituent still holds good here for the pure bred animals. For production of flesh the Berkshire stands first, the Poland China next, and the Duroc last. But if we consider the production of fat the order is exactly reversed.

If we consider the relation of the constitution of the feed to the production of flesh and fat, as referred to percentages of carcass, taking the average of the pairs, we find the following:

Nutritive ratio.	Protein.	Fat.
1 : 6.82	13.7183	41.607
1 : 7.56	12.9309	44.636
1 : 8.23	11.885	46.878
1 : 8.94	9.063	58.393

These differences, based upon the averages of the pairs, are quite marked, and we are induced from the general character of the results, to believe that they would be equally so in averages secured with a larger number of animals. With a widening of the nutritive ratio there was a decrease in the production of protein and an increase of fat production. And it therefore appears that it is possible, by increase of the nitrogenous constituents of the food, to secure an increase of the flesh or nitrogenous constituent of the body. But the question whether the modification of the usual method of feeding with a view to securing such results will be economical in every way, taking the demands of the market into consideration, as well as the increased labor, attention and cost involved, remains undecided, so far as these experiments are concerned. If we compare the record of feeding, leaving out the sows and taking the averages of the pairs similarly fed, there would indeed seem to be a decrease in production of live weight, with a widening of the nutritive ratio. But the average daily gain of one of the cross-bred barrows appears abnormally low, and if we reject it, the relations are not sufficiently definite to base any conclusion upon. It is unfortunate that we were limited to so few animals in these experiments, for it is probable that the relations above indicated would have been confirmed by other subjects.

From what precedes, these experiments tend to show:

1. That in point of flesh production, the Berkshire is superior to the Poland China.

2. That in point of production total live weight, these relations are directly reversed.

3. That increase of nitrogenous matters in the feed, increases the proportion of flesh in preference to fat in the animal body.

4. That the narrower nutritive ratio has a tendency to increase of total gain of live weight.

5. That the addition of nitrogenous matters, such as cotton and linseed meal, or even of dried blood prepared at the packing establishment, is worthy of the serious consideration and careful experiments of all interested in the great industry of production of meats.

In conclusion, I desire to express my indebtedness to Mr. F. W. Woodin, of the class of '84, who, previous to his graduation, performed the analytical work of the experiments here reported. And I further desire to acknowledge the hearty support, encouragement and cooperation received from the Regent and other officers of the University.